Railway Maintenance Engineer

Volume 18 CHICAGO—APRIL, 1922—NEW YORK Number 4

STOP THE POUNDING

Over Your Crossings by Using the

Eymon CONTINUOUS RAIL Crossing

which converts the present open throat crossing into a solid manganese continuous rail 4½ in. wide on the tread, completely insulated.

The latest improved type has been installed by the Toledo & Ohio Central (N. Y. C. Lines) at its junction with the Nickel Plate at Mortimer, Ohio.

The Eymon Crossing Company

Marion Ohio

Dressing Up Ties to Last

REILLY'S PERMANENT CREOSOTE OIL gives essentially what it says—*permanent* protection to railroad ties and timbers.

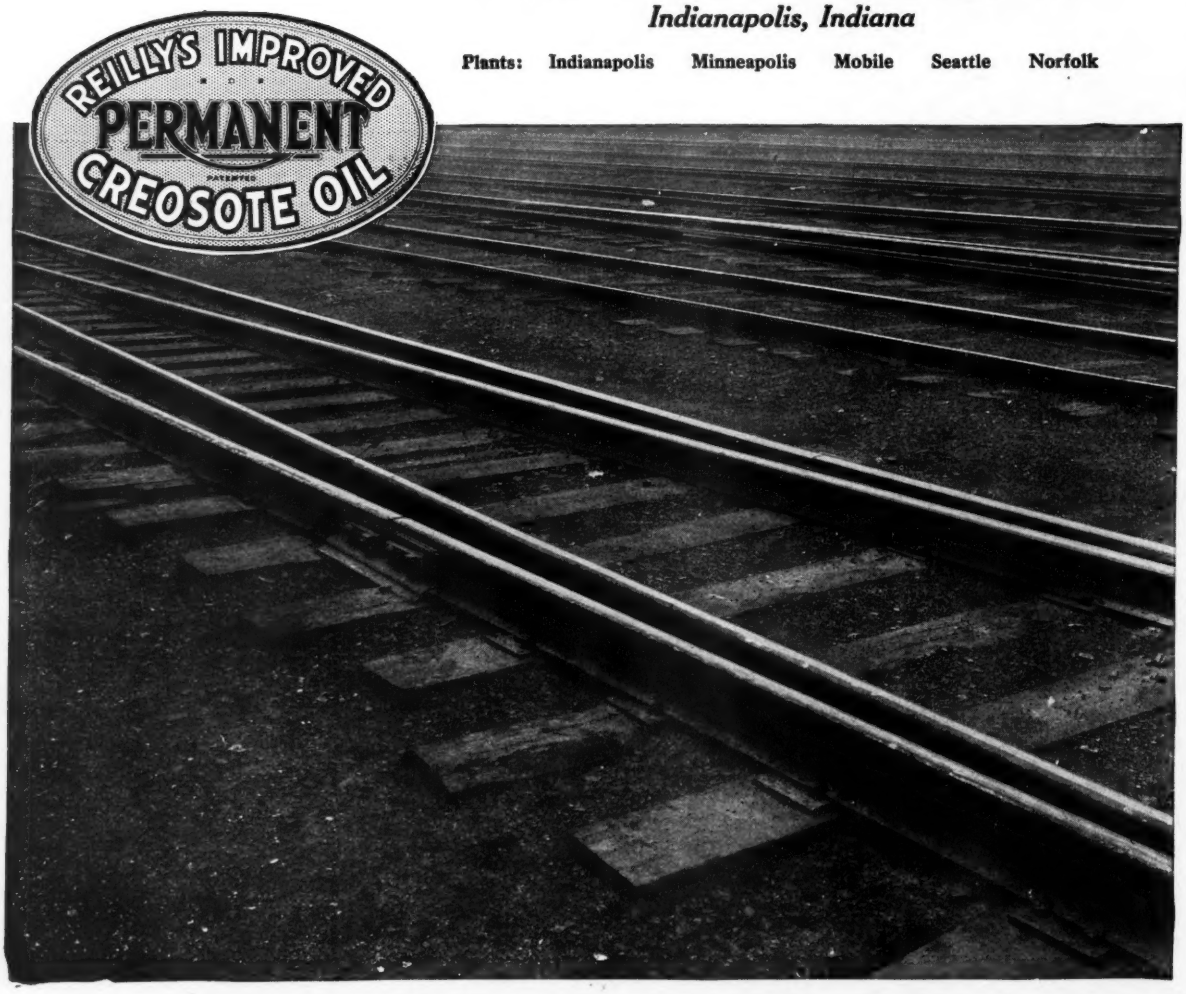
It is straight, full-bodied creosote oil without a trace of adulteration. It is not a light oil. Sun cannot draw it out of the wood. It cannot evaporate or dissolve when in contact with rain or moisture.

It penetrates easily and deeply—*and stays in the wood* FOREVER. It is the ideal timber oil. The most economical oil and is in wide use. Specify REILLY'S in your tie and timber contracts.

Republic Creosoting Co.

Indianapolis, Indiana

Plants: Indianapolis Minneapolis Mobile Seattle Norfolk



RAILWAY MAINTENANCE ENGINEER

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A lesson from the Knickerbocker Theatre Disaster

IT is a far step from the tragic collapse of a theatre building to a commonplace culvert under a railway, but the explanation now offered for the Washington disaster has a bearing on culvert design that must not be overlooked.

The Engineering News-Record, explaining the collapse in its issue of February 9, says editorially:

> "Why the roof and walls wedged themselves apart remains an unanswered question. The effects of expansion and contraction are not amenable to calculation and test, and it is these effects that must be looked upon as the agencies of destruction.
>
> "Buildings, and above all roofs, have been regarded quite universally as structures devoid of possibility of shift or displacement. That view is seen to be wrong. *Sound building practice must take full account of the possible cumulative effect of even small motions or vibrations.* The emphasis placed upon this view is the outstanding gain from the collapse."

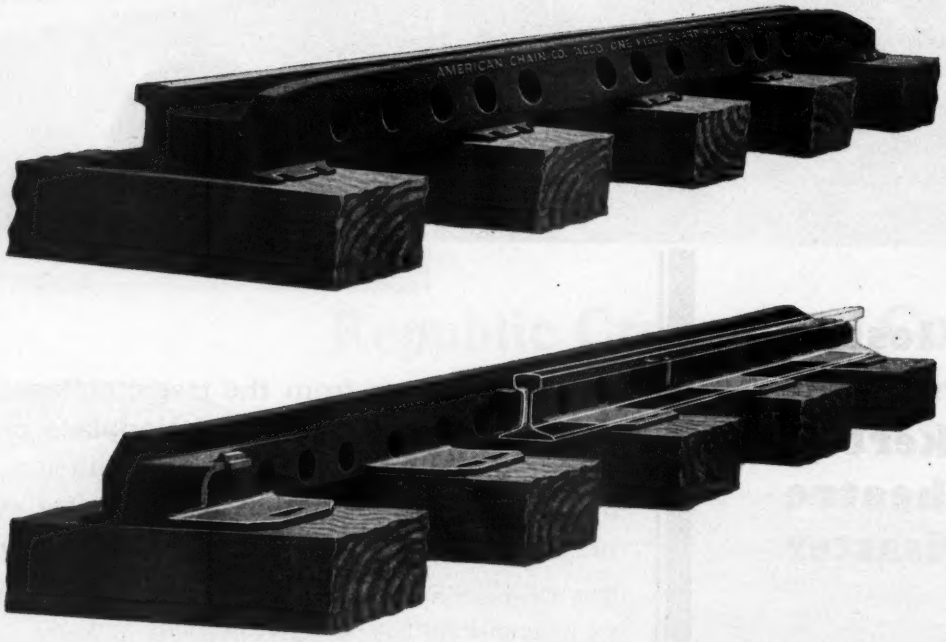
If these conditions can produce disaster in a building, how much more carefully must they be designed for in a culvert? The culvert must withstand *expansion and contraction* due to climatic change, without cracking; it must yield under the *displacement and shift* of surrounding soils, without disintegration; it must absorb the *cumulative effect of slight motions and vibrations,* without impairment.

To meet these conditions, an *elastic construction* for the culvert pipe, using materials that will not fracture, is plainly indicated.

ARMCO CULVERT & FLUME MFRS. ASSN.
215 NORTH MICHIGAN AVE. CHICAGO

Ingot Iron

"ACCO" One-Piece Guard Rail



"ACCO" ONE-PIECE GUARD RAIL is made of special analysis open-hearth steel, cast to shape and thoroughly annealed.

The design eliminates rails, bolts, guard rail clamps, and braces, and incorporates tie plates and foot guards.

It simplifies and reduces the cost of maintenance and provides a protection of the greatest strength.

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American Chain Company

Incorporated

Bridgeport, Connecticut

Reading Specialties Division

District Sales Offices:

Boston, Chicago, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco

Maintenance of Way Buyers' Guide

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Cars, Motor, Section.
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Headley Good Roads Co.

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Bucyrus Company.

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Ingersoll-Rand Co.

Drop Forgings.
Bethlehem Steel Company.

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Fairbanks, Morse & Co.

Electric Light & Power Plants.
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Engines.
Fairmont Gas Engine & Ry. Motor Car Co.

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Bucyrus Company.

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E. I. du Pont de Nemours & Co.

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Fairmont Gas Engine & Ry. Motor Car Co.

Fence Posts.
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Float Valves.
American Valve & Meter Co.

Forgings.
Bethlehem Steel Company.

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Sullivan Machinery Co.

Frogs.
Bethlehem Steel Company.
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Ramapo Iron Works.
St. Louis Frog & Switch Co.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Gages, Pressure, Gas.
Air Reduction Co., Inc.

Gas, Acetylene.
Air Reduction Co., Inc.

Gears.
Diamond State Fibre Co.

Generators, Acetylene.
Air Reduction Co., Inc.

Girder Rail.
Bethlehem Steel Company.

Grinders (Portable).
Ingersoll-Rand Co.

Guard Rails.
Bethlehem Steel Company.
Ramapo Iron Works.
Wm. Wharton, Jr., & Co.

Guard Rail Clamps.
American Chain Co., Inc.
Q. & C. Company.
Ramapo Iron Works.
Weir Frog Co.

Hand Cars.
Fairbanks, Morse & Co.

Hand Car Engines.
Fairmont Gas Engine & Ry. Motor Car Co.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

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Bethlehem Steel Company.

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Rail Joint Co.

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Fairbanks, Morse & Co.
Verona Tool Works.

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Massey Concrete Prod. Corp.

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Massey Concrete Prod. Corp.

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Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.

Nitrogen.
Air Reduction Co., Inc.

Nut Locks.
National Lock Washer Co.

Nuts.
Bethlehem Steel Company.

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Bethlehem Steel Company.
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Ingersoll-Rand Co.

Oil Houses.
Massey Concrete Prod. Corp.

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Bethlehem Steel Company.

Out Houses.
Massey Concrete Prod. Corp.

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Ingersoll-Rand Co.

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Air Reduction Co., Inc.

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Air Reduction Co., Inc.

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Chipman Chemical Engineering Co.
New Jersey Zinc Co.
Ruberoid Co., The.

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Ingersoll-Rand Co.

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Bucyrus Company.

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American Casting Co.

Pipe, Concrete.
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Ingersoll-Rand Co.

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Fairbanks, Morse & Co.

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Standpipes.
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Steel Forms.
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Bethlehem Steel Company.

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Inland Steel Company.

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Lundie Engineering Corp.

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Tie Spacers.
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Tin Plate.
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Bethlehem Steel Company.

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Tools, Oxy-Acetylene Welding and Cutting.
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Torches, Blow Acetylene.
Air Reduction Co., Inc.

Torches, Blow Combination.
Air Reduction Co., Inc.

Torches, Welding Acetylene.
Air Reduction Co., Inc.

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Track Drills.
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Track Insulation.
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Track Jacks.
Verona Tool Works.

Track Material.
Inland Steel Company.
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Weir Frog Co.

Track Scales.
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Track Tools.
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Verona Tool Works.

Trestle Slabs.
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Vacuum Pumps.
Ingersoll-Rand Co.

Varnish, Electrical Insulating.
Ruberoid Co., The.

Washers.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Waterproofing.
Ruberoid Co., The.

Weed Killer.
Chipman Chemical Engineering Co.

Welding, Oxy-Acetylene.
Air Reduction Co., Inc.

Wheels (Hand and Motor Car).
Fairmont Gas Engine & Ry. Motor Car Co.

Wire.
Armco Culvert & Flume Mfrs. Assn.

Wire Rope.
Fairbanks, Morse & Co.

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Chipman Chemical Engineering Co.

Wood Preserving Oil.
Republic Creosoting Co.

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"Curved track tamped with 'Imperial' pneumatic tampers holds to line and surface far better than if tamped by hand," says a prominent railroad man. And further,

"Track which was formerly almost impossible to hold without frequent retamping when done by hand, is now kept in first class condition by pneumatic tampers, with a fraction of the former labor."

The reason "Imperial" tampers make a better and more lasting roadbed, both on curved and straight track, is that they work in pairs opposite each other, and tamp the ballast firmly in under the tie. By operating with a uniform air pressure they tamp the ballast compactly and uniformly under all the ties. The result is a superior roadbed that stands up under heavy traffic.

"Imperial" Tamping Outfits are also great labor savers. Ask for further information about them.

INGERSOLL-RAND COMPANY

11 Broadway, New York City

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23

164-TT

Ingersoll-Rand

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1/3 more per dollar

DU PONT

DUMOR

Your explosives dollar is now worth $1.35

DUMORITE comes with 135 to 140 1¼ x 8 sticks to the 50-lb. case—regular 40% dynamite has 100 sticks to the case.

The price is the same per case.

Dumorite, under ordinary conditions, does approximately the same work as "40%," stick for stick.

In addition, Dumorite is a guncotton-nitroglycerin dynamite *without a headache.*

And Dumorite is non-freezing at any temperature.

Are these advantages in cost and efficiency enough to justify ten minutes of your time—the time it will take you to write our nearest branch office outlining the requirements of your particular work?

Our Service Department has been able to show a great many operators that Dumorite will do their work better or equally well and at a materially less cost.

Probably you, too, will be able to save money by using Dumorite.

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E. I. du Pont de Nemours & Co., Inc.
Explosives Department
Wilmington, Delaware

DITE NON-HEADACHE NON-FREEZING

Save Time in filling your tenders
Prevent damage from Water Hammer

WITH THE

POAGE Style H WATER COLUMN

An Instantly Adjustable Spout

Quicker work in filling tender tanks is possible with the Poage Style H Water Column equipped with the Fenner drop spout.

A vertical range of five feet and a lateral range of three feet make accurate spotting of the tender unnecessary.

The spout works equally well with tenders of different heights.

The spout avoids the usual winter troubles in cold climates. It has a non-freezable telescopic joint. This is entirely open. There is no packing of any sort. Yet it does not leak or waste a drop of water.

Quick Closure Without Water Hammer

Even on high pressure water mains, the Poage Style H Valve is closed quickly without danger to the mains from water hammer. The flow is cut down 85 per cent very rapidly and the remaining 15 per cent more slowly.

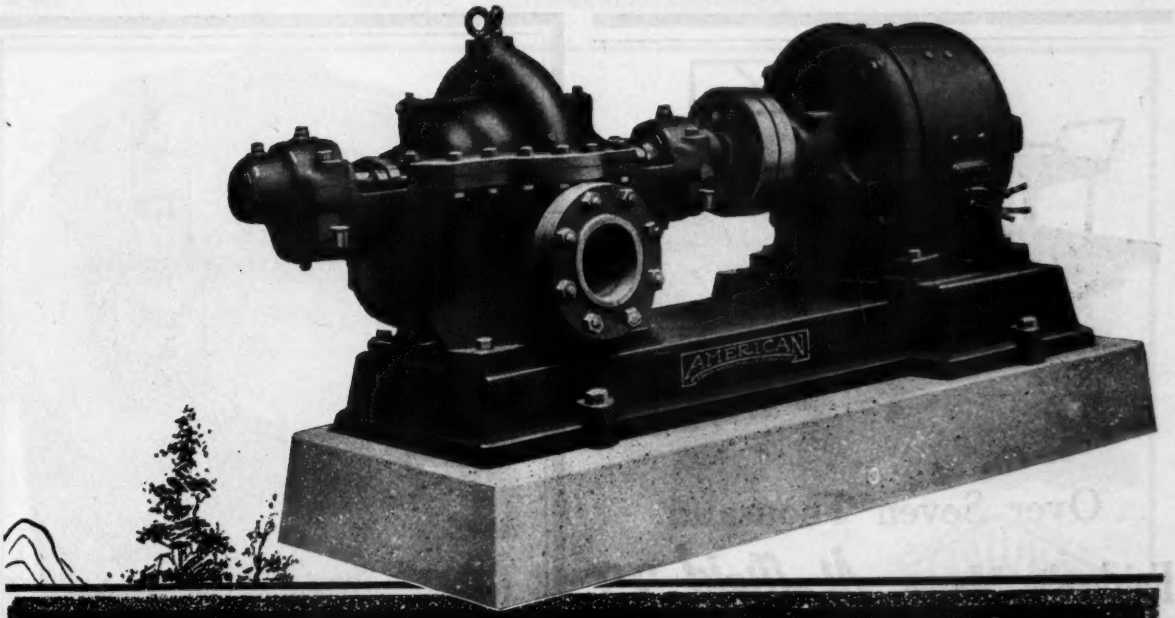
Tests by the University of Illinois have shown that this principle provides the quickest closure and makes water hammer impossible.

Investigate the Poage Style H water column. Give it a thorough trial.

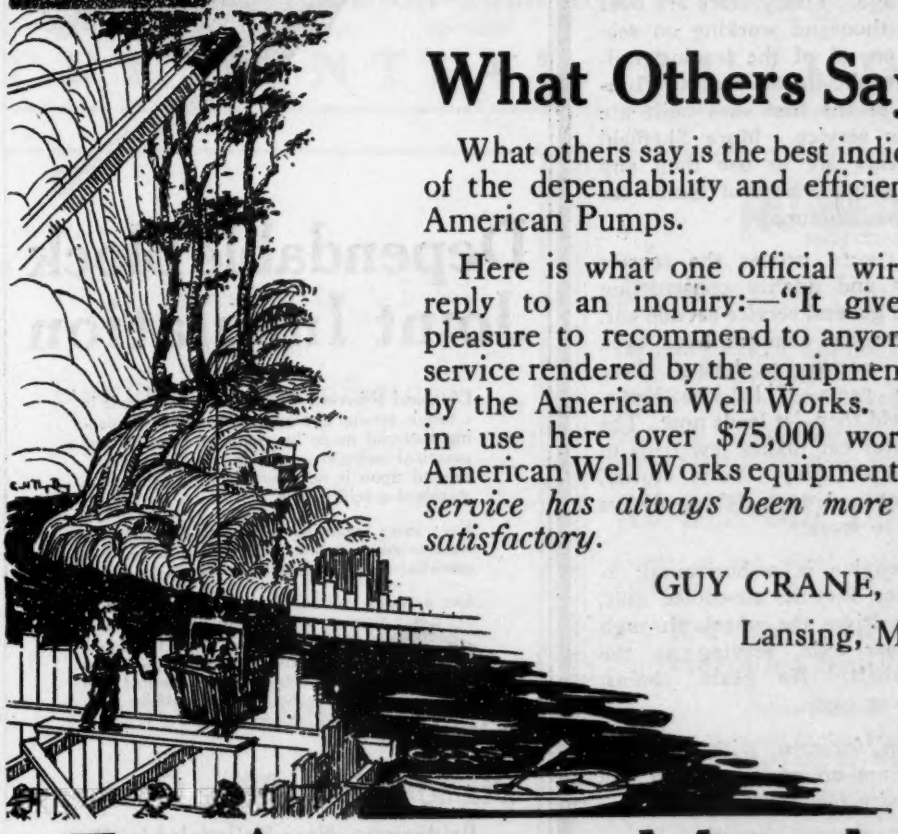
Manufactured exclusively by

The AMERICAN VALVE & METER CO.

Cincinnati, Ohio



AMERICAN



What Others Say—

What others say is the best indication of the dependability and efficiency of American Pumps.

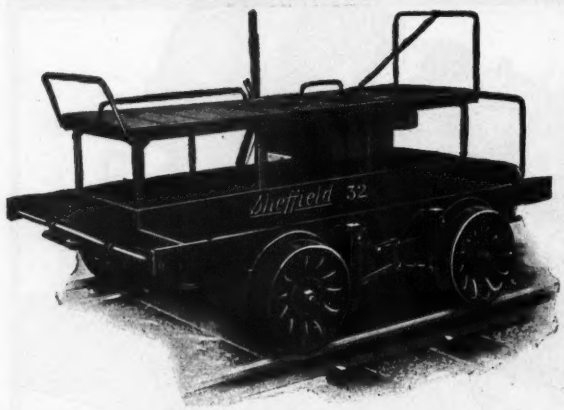
Here is what one official wired in reply to an inquiry:—"It gives me pleasure to recommend to anyone the service rendered by the equipment sold by the American Well Works. Have in use here over $75,000 worth of American Well Works equipment. *The service has always been more than satisfactory.*

GUY CRANE,
Lansing, Mich."

THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
FIRST NATIONAL BANK BLDG.



Over Seven Thousand Fairbanks-Morse Sheffield 32 Motor Cars in Service

The Sheffield "32" Motor Car was placed on the market twelve years ago. Today there are over seven thousand working on sections on all of the leading railroads of the United States. Hundreds of the first cars built are still in service. More Sheffield "32" cars are in use than any other single model of motor car ever manufactured.

This record proves the correct design and quality construction of this general service section car. No material changes have been found necessary during these twelve years—it led the Motor Car field then—it leads now. The 32 motor car makes few trips to the repair shop. It is sturdy, efficient and dependable—always ready to work.

The engine is a horizontal, 2-cylinder, 2-cycle, air-cooled unit, which drives the wheels through the rear axle, serving as the crankshaft. No gears, chains, valves or cams.

Section foremen with Sheffield "32" cars do more work in less time with fewer men.

Fairbanks, Morse & Co.
MANUFACTURERS CHICAGO
Oil Engines - Pumps - Electric Motors and Generators - Fairbanks Scales - Railway Appliances - Farm Power Machinery

Dependable Block Joint Insulation

Diamond Fibre serves faithfully because it is a tough, strong, almost indestructible insulating material made by practical men to meet practical railroad conditions. "Old timers" depend upon it because it more than meets standard specifications.

For more exacting work—where extreme waterproof and high electrical qualities are essential—use Condensite Celoron.

Let us send you full information on both of these standard materials. Write us today for booklets. Both are topics upon which every practical railroad man should be fully informed.

Diamond-F

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Branch Factory and Warehouse, Chicago
Offices in Principal Cities
In Canada: Diamond State Foundry Company of Canada, Ltd., Toronto

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New York Boston Baltimore Birmingham Chicago Detroit San Francisco London, Eng.

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in the
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Standard—
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Rail Joints

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61 Broadway New York City

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ROOFING

The original asphalt ready-to-lay roofing. Made from the same formula for over 28 years.

Smooth surfaced, fine talc dusted finish. Special large-headed sherardized (zinc impregnated) nails and Ru-ber-oid Lap Cement in each roll.

Ruberoid Roofing wears longer than ordinary prepared roofings, therefore, most economical.

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Green or red, slate surfaced, 8"x15", 5 inch exposure.

Ru-ber-oid Giant and Hercules Building Papers

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Ruberoid Cement-Waterproofing
Ruberoid Oil Paint
Ruberoid Graphite Paints
Ruberoid Cement Floor Filler and Enamels
Ruberoid P & B Rapid Asphalt Paint
P & B Insulating Compounds
P & B Insulating Tape

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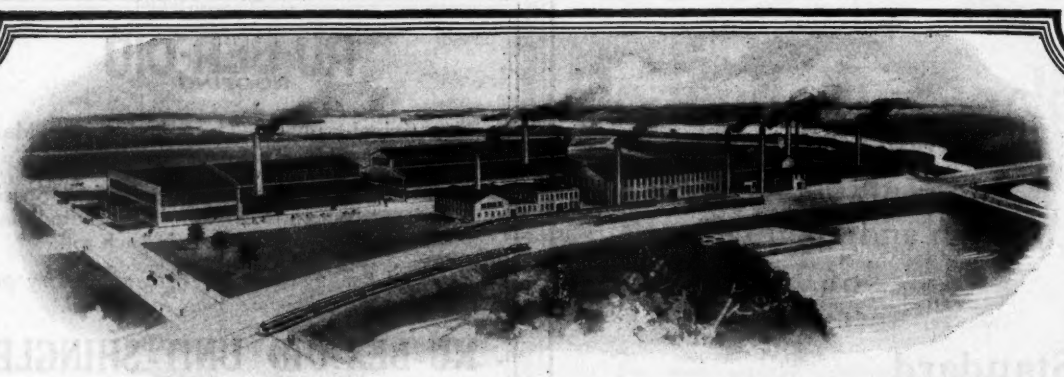

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Railway Maintenance Engineer

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WOULD YOU LIKE TO KNOW

For what heads a centrifugal pump may be used?

What kind of a mop is most suitable for swabbing waterproofing?

How many men is takes to lay 130-lb. rail by hand?

How to organize ditching operations?

What kind of stone to use for a macadam highway crossing?

Answers to these and other practical questions will be found elsewhere in this issue.

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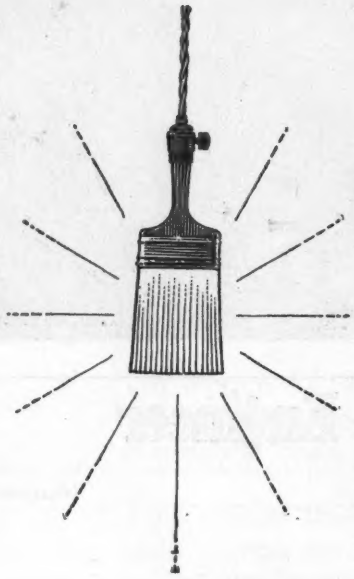

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Railway Maintenance Engineer

Is Your Way the Best

The "What's the Answer" department in this issue covers five pages. Further evidence of the interest taken is indicated by the number of readers who have contributed solutions for the problems submitted. The value of these pages, as we see them, lies in the fact that the answers to the questions are not all alike. There is more than one way to skin a cat. Perhaps you have solved a problem to your own satisfaction, but are you sure that there is not a better way? Send in your problem, and also (if you feel so inclined) your answer for it and we will publish it with the other answers received. Perhaps your solution will be better than any of the others, but even in that event you will be recompensed for your pains by the satisfaction of knowing that your way is the best.

The Trials of the Pioneer

Although it is scarcely more than 10 years since the motor car was being developed experimentally on a western road, its economy has since been demonstrated to such an extent that it is almost universally employed today. It is hardly more than two decades ago that a few roads were investigating the treatment of ties and but for their patience and perseverance it is possible that many roads would not now be enjoying the large economies which are resulting from the doubling of the life of timber in this manner. The building up of worn frogs and more recently of rail ends by oxyacetylene welding on several other roads is one of the more recent developments which offers vast possibilities for economy in maintenance operations, while pioneer work is being done in the adaptation of labor-saving equipment to maintenance operations on still other roads. However excellent these developments are, they are simply the forerunners of many others which will lead to equally large savings. Just as the developments referred to above have come from the efforts of men on individual roads who have become interested themselves in these experiments and have given freely of their time and experience, so the new economies will come to the extent that the railway men apply themselves to the task of analyzing their problems and of co-operating in their solution. Development comes only as roads and men are willing to pioneer and to give freely of their resources. This has been the history of railroading in the past. It will be so in the future.

Taking Advantage of the Opportunity

Contrary to the usual practice of curtailing expenditures during periods of diminished traffic, one large road whose revenues will be reduced materially by the coal strike which is scheduled to become effective on April 1, plans to take advantage of the lull in traffic to push to completion a project for the reduction of grades and the construction of an additional track on a portion of its main line. During the switchmen's strike of two years ago the maintenance officers on another road took advantage of the reduction in the movement of traffic to push the rail laying program and other operations involving the use of work trains. Instead of cutting expenditures in proportion to temporary reductions in revenues, large economies can be effected in the cost of the work itself by doing it when train movements are at a minimum, while at the same time avoiding interference with the heavier traffic of later months. In fact, the improved facilities themselves will be available sooner for the handling of this heavier traffic which will follow. It is recognized that a road can spend money only to the extent that the funds are available, and that many companies are not now in a position to finance large improvements. However, this condition is far from universal and it is a fact that even the more prosperous roads have not availed themselves of these opportunities as fully as the economies warrant. No single influence adds more to the cost of maintenance work than the prevalent custom of doing most of it during the periods of heaviest traffic. Having determined upon a season's program of work, economy demands that it be done at the most favorable season. It is to be hoped that the coal strike, if it materializes, will not be without some benefit to the maintenance department in this direction.

Making Good Last Year's Deficiencies

During 1921 the railways of the United States spent 26 per cent less for the maintenance of their tracks and structures than in the preceding year. This is not, however, an accurate index of the relative amount of work done. Some benefit accrued from reductions in the prices of certain materials; there was a decrease in wages during the latter months of the year; even more important there was a marked increase in the efficiency of the men as work became scarce and unemployment in other industries increased; the fall and early winter were also favorable for the properties in most localities and this condition has prevailed, with certain exceptions, until now. The roads are, therefore, entering the spring in a better condition than the volume of last year's maintenance expenditures would indicate, although there are certain deficiencies in rail and ballast renewals, in bridge replacements and particularly in painting and similar work. From the standpoint of ultimate economy these deficiencies should be made good at the earliest opportunity. Realizing this fact, most of the roads, encouraged by improved earnings, are planning more liberal expenditures this season. However, even with the most liberal programs it will still be necessary for maintenance forces to give first attention to those duties which will contribute most directly to safety and smooth riding for some months to come.

The Evil of Unnecessary Spiking

While it is self-evident that no spike should be left undriven that is required to hold rail securely in position, the Tie committee of the American Railway Engineering Association very properly called attention to the danger of over spiking in the report which it presented before the recent annual convention of that organization. In this report the committee stated that "when a number of spikes is sufficient to hold the rail and gage properly any additional spiking injures the tie at the most critical point." Ties are frequently injured by unnecessary respiking. This is

illustrated by an incident which was discovered within the limits of a timber-treating plant on a western railway where a gang responsible for the maintenance of the tracks within the yard renewed the switch ties out of face in the ladder. Within a couple of weeks the gang returned and renewed the rails and frogs on the same lead in spite of the fact that these materials were on the ground at the time the ties were renewed. This necessitated the redriving of the spikes in the newly treated ties, damaging them to an extent that should not have occurred for several years. If this can happen at the entrance to a timber-treating plant where the men are brought into daily contact with the preservation of timber and the necessity for its protection, the problem of adequate education regarding the handling of treated timbers and the supervision in their handling, becomes more evident. Maintenance of way officers and foremen must be educated to the value of the proper treatment of timber and to the necessity for its protection.

THE CONTRACTING OF TRACK WORK

WHILE MOST maintenance of way officers are opposed to the contracting of maintenance of way work in principle, many of them are now considering it seriously as the season for active operations approaches because of the abnormal wage situation which prevails. Their opposition is based primarily upon their feeling of responsibility for the safety of traffic and their hesitation to introduce a third party with the division of responsibility which necessarily follows and which may introduce a hazard. In normal times this fear has restricted contract work to a few roads and to relatively limited operations there. However, the failure of the Railway Labor Board to reduce the wages of maintenance of way labor as rapidly as corresponding labor has been deflated in other industries has created a differential against the roads which has caused many of them to look to contracting as a means of reducing their expenditures.

As described in the October, 1921, issue, a number of roads have contracted such work as the renewal of rails and the placing of ballast which lend themselves to ready measurement on a basis of unit prices for a number of years. Other roads have contracted such work on a basis of cost plus a fixed percentage. More recently at least one large road turned over all of the maintenance of its tracks on certain portions of its lines to a contractor. Under any of these plans the railways can now effect large savings because of the fact that a contractor, who is free to pay the market rates for his men, can do the work for far less than the railways. It is this situation which is causing many maintenance officers to overcome their prejudices against contracting and to look upon it with favor.

THE DEVELOPMENT OF THE WOODEN TRESTLE

AT THE recent convention of the American Railway Engineering Association, the Committee on Wooden Bridges and Trestles presented designs for pile and frame trestles which were adopted as standard practice for publication in the association's manual. However, before adoption considerable opposition was raised by certain members of the association who felt that the designs submitted by the committee could not meet conditions all over the country. Conceding the validity of the objections raised, there is no question but that the design of the structures the country over has gradually approached a high degree of uniformity. Considering the time that this form of construction has been used in this country and the number of structures being renewed each year, it is difficult to see how many further modifications can be made, particularly as applied to open deck structures. The designs have changed to a marked degree since the early days of American railroading. The corbel has almost entirely disappeared and the mortise and tenon joint, once common for cap and post connections, is long a thing of the past, although some trestles are still in use in which the cap is in two pieces, placed on either side of tenons formed in the tops of the piles.

The only relic of early days which seems to persist is the notched guard rail, but there is reason to believe that even this will eventually be superseded. These changes have come about gradually and have been prompted partly by advance in designing practice with a realization that cutting into the timber decreases its strength. But by far the most important influence has been exerted by the maintenance men, the men who live with these structures from day to day and learn their weaknesses by noting where they "give out" first. Their work in the renewal of these structures has shown them what details are the most expensive in labor or the most wasteful in material and as the years have gone by experience has taught them what to accept as the most efficient form of construction. In the case of the creosoted pile trestle with the ballasted deck, the last word has not yet been said and history must necessarily repeat itself in the gradual refinement in design as experience points to improvement.

HE STAYS, WE GO

"TIME goes, you say? Ah, No! Alas, time stays, *we* go." Can anything more fittingly express the lot of the section foreman? As we ride over the line on the rear end of passenger trains and the right-of-way is unfolded before us, gang after gang passes before us in unending succession. But, to the man on the track, it is he who stays, we go. The track foreman's world is definitely marked off for him by the section limits signs. Between those limits he has, not six miles of railroad, but six miles of right-of-way, roadbed, ballast, ties and rails. The real railroad rushes by him with each passing train. It is with him but a moment and then is gone. The brakeman who waves him a friendly hand from the top of the caboose, the roadmaster who drops off to see him now or then or slips him a butterfly from the back of No. 6—they are both a part of this railroad which brushes by him each day.

Of course, he sees a part of the line once in awhile when he gets a pass to take his wife on a shopping trip to the city and he gets up the line as far as 20 miles or so when there is a washout or the track is torn up by a wreck. But day after day it is the six miles for him and the railroad rushes by. Even if he has a yard section, where he is in daily contact with the men of the train crews, the roundhouse, the coal dock, the rip track and where he is constantly hindered in his work by the shuttle movements of the switching crews, the railroad—the real railroad—is always stealing in or slipping away through the switches at the end of the yard leads.

This feeling of aloofness which the section foreman experiences, the thought that the great bulk of the railroad lies beyond the limits of his own operations, is surely a handicap to him in his work. It represents something which his superiors should help him overcome. Let him hear more of the work on the other sections and of what the railroad is doing in general. Let him ride over the division occasionally under conditions that make it possible for him to see the track and the work that his brother foremen are doing. In other words, help him to feel that the railroad is with him on the track each day, even when no train is passing.

Letters to the Editor

MOVING PICTURES OF TRACK WILL STIMULATE INTEREST

College Station, Texas.

TO THE EDITOR:

One of the greatest assets of a railroad is a loyal section foreman, for one act of negligence on his part may spell costly disaster. He has a very responsible job. A track may spread at one joint only; creeping rails on a hot day may throw a turnout out of adjustment; heavy rains at night may undermine the track, especially in cuts; scores of maintenance problems confront him continuously, problems impossible for the best of roadmasters to keep in touch with. When a section foreman's loyalty is in question, his retention in the service of the company becomes a hazard to his fellow employees, to the traveling public and to company property.

Loyalty can be gotten through fair treatment; increase in pay has little effect. Provide the foreman with a well maintained section house free of cost; make his home attractive. Some roads charge a foreman house rent and then make no effort to keep it in repair. The effect must be demoralizing. Keep him supplied with good tools, see that his motor car is kept in good shape, give him a chance to do good work. Frequently the section house is located far from school; the average foreman has this item in mind constantly.

Permanence of location is conducive to efficiency. A foreman located for a long time on a section of track knows that section far better than the roadmaster. He knows exactly where to look for trouble in case of bad weather, he knows how traffic will affect track at various locations. I know one foreman who has been on the same section for 28 years. In spite of the fact that 80 per cent of his track is on curves and traffic is heavy this man has never had a derailment due to defective track.

During government control of the railroads efficiency fell rapidly, high rates of pay and lack of discipline had a demoralizing effect on nearly all trackmen except the old-timers; when reductions in pay came they did not complain. Pre-war efficiency has been regained only in part. Incentive is lacking. Practically all roads realize that about 75 per cent of the efficiency of the section foremen depends upon the personality of the roadmaster. Trackmen assume that they labor for the roadmaster and not for the railroad. It is for this reason that many general managers stipulate that no roadmaster's appointment be permanent without their personal sanction.

The management of a railroad should see to it that a foreman's point of view be broadened so that he will be made to consider the railroad as a whole; various methods have been used to get this result. Foremen are called in to meet with all maintenance of way employees, where matters of general interest are discussed; comparative costs of work done by the various track gangs are arranged to show unit costs; maintenance of way magazines are sent to foremen, etc.

A section foreman's ambition is to be made roadmaster. A roadmaster's division comprises about 18 sections; a foreman has, therefore, one chance in 18 for promotion. Some roads make their appointments from the engineering department, thus making a foreman's chance more visionary. The policy of choosing roadmasters from the engineering department is bad; however, to train men for district engineers by first having them work as section foremen and then as roadmasters is good.

Other means should be devised to awaken his ambition. It has occurred to me that a moving picture, taken from the back of a train of one roadmaster's division, will disclose irregularities in line, skeleton track, condition of ballast shoulders, weak embankments, condition of the ditches in cuts and of the right of way and fences, etc. A meeting of foremen, including their families, should be called and the picture viewed, the roadmaster or district engineer making comments as the picture is shown; prizes ought to be awarded as merited, and a separate picture shown of the foreman and gang who receive the award. To make the matter still more interesting a comparison of the best track and the worst could easily be made. If the cost of this experiment is too great as applied to the entire railroad, the same picture could be shown to foremen on the other divisions, with the understanding that some time in the future pictures of the other divisions, with the understanding that some time in the future pictures of the other divisions will be taken.

I believe much good will result from such a plan; foremen will turn out more uniform work, incentive will be augmented and life will be made brighter for the trackman. Section foremen, on account of the restriction of their trade, lead a lonely life; they do not have the opportunity to mix with their fellowmen often; their thoughts and ideas center on their occupation, and on the men in the maintenance of way department with whom they are thrown in contact. This being the case, their perspective is limited; everything possible ought to be done to clear the view, and thereby make each one more of a man and less of a machine. With the proper coaching they can be made to feel proud of the institution of which they are a part, loyal, enthusiastic and energetic.

B. D. MARBURGER,
Professor of Railway Engineering, A. & M. College of Texas.

GET BEHIND OUR RAILROADS

The greatest American interest next to agriculture is that of transportation. We cannot have prosperity, our country's commerce cannot go forward confidently unless our railroads are once again made prosperous, are put in position to carry the transportation of the country, and are able to attract the capital needed for them to perform their service as common carriers.

I am a firm believer in the fact that the way to get results in life and in industry is to put your faith in men. We should stop knocking our railroads, our railroad presidents and railroad men in general. We should, of course, prevent evil and scandal, but we must also be careful not to stifle progress. Most of our railroad presidents started at the bottom of the ladder. There isn't a man today at the head of an American railroad who is not a credit to the industry with which he is connected and an asset to his country.

The American people are today boss of the railroads. Let us honor these men, help them in the solution of their difficulties, and make them feel that we are with them for progress and prosperity.—Charles M. Schwab.

FIRE PREVENTION ON THE PENNSYLVANIA—The number of fires extinguished by employees with the company's fire-fighting apparatus last year was 268. The loss caused by these fires amounted to only $26,112.30.

Getting Good Results With Ditchers*

In Which the Author Tells How Excessive Costs Were Reduced on the Chicago, Rock Island & Pacific

By R. V. Ford

Formerly Supervisor of Work Equipment, Chicago, Rock Island & Pacific.

WHEN, as the incumbent of the newly created office of supervisor of work equipment on the Rock Island, I made my first inspection trip to ascertain what equipment there was and what should be done with it, I located five steam ditching machines and one air ditching machine. One steam ditcher was in service and the others were stored; two in abandoned gravel pits and two at shop points. The air ditcher was set aside on a scrap track at one of the large shops.

The ditcher in service was operating on a branch line, using 20 flat cars, an unloader engine, three plows (right, left and center) and a bank leveler or spreader. This ditcher would load the flats, then proceed to plow them off and level the dirt with the spreader. Having once located and overhauled this equipment, it was then organized into separate outfits, each comprising one ditcher, 20 flat cars, three plows, an unloader engine and a bank leveler. This, with the locomotive, caboose and one tool car, made a train of 25 cars, upon the organization of which work assignments were requested for each of the outfits.

The assignments were granted, but the showing made did not come up to expectations. I felt that something was wrong and started out to investigate. The first roadmaster interviewed said he could not use the ditching outfit on his main line track. He could use it on the branch lines, but could not get an appropriation to spend the money on branch line work. He explained his position about like this: "You know our main line is busy. We call it a ten-minute service and we cannot hold trains. This means that the ditcher must leave a siding, go to a given point, operate and get back into clear in ten minutes, handling 20 or more cars." As a possible solution of this problem the 20 flats with the Lidgerwood and plows were replaced with two dump cars. The roadmaster was very much pleased with this arrangement and handled the ditcher the entire season on his main line with an average performance of over 200 yd. per day.

The Cost of Ditching Was Excessive

All the ditchers were equipped this way and I felt that we were doing well. In fact, we were doing so well that the roadmasters were anxious to have a ditcher. However, at the end of the year, when accounts were made up, it developed that the cost of ditching was too high, some of the work running up to 80 cents per yd. The reasons for this, as it appeared, were two: first, the dump cars were crude and costly to operate, and second, most of the ditching was done in wet weather. To operate the dump cars it required four men to handle the doors. Furthermore, if the dirt was dry and sandy, although the cars dumped easily, considerable dirt would invariably fall back over the rail and require shoveling off. On this account it was found necessary to use six men instead of four to clear the tracks quickly. If the dirt was wet the cars would have to be cleaned with shovels and this called for all the men available, including the section men, to avoid hiring more men in the ditcher gangs.

To reduce the cost of ditching, therefore, two things had to be done; first, to procure quick acting dump cars; second, to do the ditching in dry weather. To get the cars would cost money; to get the ditching done in dry weather would call for enough ditching machines to get ahead of wet track, that is, to get the worst wet places ditched during dry weather, so that when it rained the water would run off instead of lying there until a ditcher was sent to cut a drain. Both of these plans, however, worked out satisfactorily, as a result of which the cost of ditching was reduced to 11 cents per yd. in 1917 and was held at about 25 cents per yd. under the highest wage schedules in 1919 and 1920. The output was increased from 100 yd. and less per day, with the first 20 flat car trains, to in excess of 500 yd. per day with the dump car trains.

Much Was Done to Improve Labor Conditions and the Equipment

Such progress called for a close study of the ditcher organization and many drastic changes. While the first essential is a man at the head of the work familiar with machinery and men, good machines and good, reliable men are also essential; and men require careful attention. They must be kept comfortable and satisfied; have good living conditions and some one to see that they get what they need in the way of supplies and repairs.

With this in mind many things were done, an enumeration of some of which may prove interesting. On this road the ditcher works the entire year; north in the summer, south in the winter. Ditching and filling small bridges form the principal work. As a result the crew must live in a car continually, excepting for short periods when they are able to visit their families. In order, therefore, to provide comfortable quarters for eating, sleeping, resting, making out reports, etc., old cars were taken and rebuilt throughout. The ditcher engineer was allowed to furnish the car in any way he wished, and many changes were made to conform to the ideas of the men.

On account of the low rate of pay allowed for ditcher firemen, young men were hired, preference being given to boys just out of good schools or colleges. They almost invariably developed into engineers and jobs were procured for them on other roads if we could not place them. Firemen are assigned permanently in the same way as engineers to certain ditchers and all assignments were made so as not to allow "bumping" by other men. The oldest fireman served also as an extra engineer and was thus available for relief work when regular engineers were off duty. The organization was also such that engineers were allowed to hire local men to replace a fireman temporarily.

The ditchers themselves were equipped to carry one day's supply of coal, thus necessitating coaling in the morning only. Another improvement was made by running water pipes from each ditcher through each dump car to the locomotive tender. With this arrangement it was possible to take water while the train was running, thus doing away with any delay consequent on the limited capacity of the water tanks on the ditchers. To improve the performance of the ditchers further many features were also introduced with reference to the machinery and as a result of all the changes the ditcher equipment

*From an article in American Ditcher Scoopings.

became the least prominent of the causes of delay given.

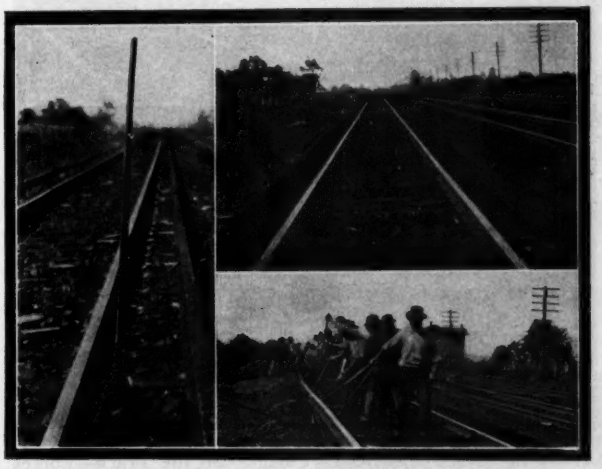
One improvement which helped considerably in avoiding delay on the work was a device for cleaning the dump cars. When working in wet dirt the cars required cleaning, as the mud would stick to the bottoms. To avoid the delay of shoveling this, a heavy board was made, pointed or sharpened on one end and a chain applied to the other end so that it could be handled by attaching it to the dipper. When using this the car was tilted, after which the mud could be cleaned off in a few minutes.

The cars were dumped by pulling a cord attached to the platform of the caboose and small home-made spreaders were used, each having a nose which could be lowered to the rail. In this way the rail could be cleaned by a movement of the train and much shoveling was avoided.

The ditcher outfits were assigned to divisions and the trains "bid in" by crews. No inquiry was made as to whether these crews had experience in ditching, and this did not really matter, excepting that in some cases, where a roadmaster would give the conductor entire charge of the job, the latter would attempt to instruct the ditcher engineer. However, there were but a few of such cases and in each case it developed that the ditcher engineer was doing poor work. This trouble was overcome by requesting the roadmaster to make two copies of his instructions, giving one to the conductor and one to the ditcher engineer, both men thus knowing exactly what was wanted and having no reason for hindering the work.

Laying Rail Under Heavy Traffic

ON THE majority of the railroads of this country, rail is renewed under conditions that fall under the general head of laying under traffic, although the details may vary greatly. Again, the majority of roads are able to secure more time for their track forces when it is necessary to renew rail than is possible on roads with dense traffic. Thus the details for this class of work are not developed so carefully on the average road and an article descriptive of a rail laying performance under difficult conditions becomes interesting for this reason. The work covered in this article was performed near New Brunswick, N. J., on the four-track main line of the Pennsylvania Railroad between New York and Philadelphia, which line carries approximately 27 per cent of the total number of passenger trains operated on the Eastern region of this road and all of the freight traffic moving to and from its New York terminals. It is, therefore, very necessary that rail to be laid must be handled quickly and efficiently. In the instance described here, 50 new 130-lb. rails with tie plates were laid in the eastbound passenger track in 13 minutes.



(Left) The type of gooseneck employed on the Pennsylvania. (Above) A string of rail ready to be run in. (Below) Throwing out the old rail and throwing in the new.

Because of the limited amount of time available for the maintenance forces, a more or less fixed routine has been developed to fit the particular conditions encountered in each locality. The forepart of each working day is devoted to work on the old rail, the running-in of the new steel and the completing of the performance. The remainder of the day is given over to preparing for the next day's run. The work is performed with extra gangs, numbering approximately 35 laborers, with a supervisor and two foremen in charge. A signal man and a carpenter are also assigned to the rail laying gang. New steel is always laid in the direction of the traffic movement since there is usually a slight difference in the heights of the old and the new rail at the last joint laid. Thus the new steel is kept from being battered at the ends by having the wheels of the locomotives and cars run from the high to the low rail.

Each Man Is Assigned a Definite Duty

In laying rail in this heavy traffic section, each man is assigned a definite duty during the preparation of the track, the running-in of the rail and the finishing-up work. Because of the overlap from one day to another the work will be described as a complete cycle or operation starting from the beginning of one cycle rather than at the beginning of a day's procedure. At the start, the rail which has been distributed between tracks previously is picked up and re-distributed along the ends of the ties in strings of 50 to 60 rail lengths on each side. This work is performed very carefully, the first rail being laid or set-up so that one end comes exactly opposite the center of the joint, marking the point where the new work begins. A special thermometer having a graduated scale which gives the proper spacing for expansion is then placed on the rail and a reading taken. As each rail is placed in position, a template or spacer of the proper thickness is placed between the rail ends. At the same time, a spike is driven at each end of the rail in order to prevent it from working in toward the running rail. The 50 or 60 rails are strung out in this manner by part of the force while the remainder follow along behind drilling the holes for bond wires, and installing and bolting up the splices. Only one side, or, as it is called, one string, is bolted up at a time, each string of rails being run in on successive days.

As soon as the 50 or 60 rails are strung out in this fashion and completely bolted up and bonded with two wires, it is then necessary to connect a rail of the same section and weight as the rail in track, in order to fill in the gap between the last new rail to be laid and the old rail to be left in track. A rail of this section is cut to the exact length to fill in this gap and a compromise joint used to connect the two different sections of rail. When this has been done, the steel is ready to be run in and the forces start at the preparation of the track. Actually this work is so timed that the work of preparing the track for laying rail occurs only slightly before the track is given over for the replacement of the old rail.

In preparing the track, the spikes are pulled from every alternate tie and the tie plates removed. The holes are then plugged with white oak after which the tie and tie-plugs are adzed to a new seat. The tie plates for the heavier rail are inserted on these alternate ties and one spike driven partly down on the inside of the rail. This insures that the new rail will come to gage automatically when it in swung in against the spike. The remaining spikes and tie-plates are left untouched except that each spike is loosened slightly just before taking over the track in order that they can be pulled with one quick movement of a goose-neck spike puller.

The Running-In of the New Steel

While the work of preparing the track has been under way, the supervisor has been keeping in touch with the train dispatcher over a field telephone. As soon as it is known that the track will be released to the rail laying force, two flagmen are sent out with necessary equipment for flagging trains that might approach from either direction, starting and ending their duties, however, only on signal from the supervisor. The track is released to the forces after the passage of some particular train, the identifying data for which has been given. With the passage of this train, the signal is given, the gang starts work and the flagmen take up their duties while at the same time the signal man disconnects the battery wire from the relay controlling the block, thus giving both flag and block protection.

Usually a definite time is given the forces in which they must lay the rail and return the track to service. In this case, the time allotted was 18 minutes. Naturally the men must work fast, a condition which usually results in their running between stops. In general, the forces are assigned as follows:

1 man flagging
1 man removing the first splice
4 men pulling spikes with goose-neck spike pullers
8 men barring out the old rail.
2 men with bars to guide old rail over new. } (Foreman in charge)
2 men removing old tie-plates
8 men throwing in new rail. (Foreman in charge)
9 men spiking
1 man in charge of the last joint
1 man flagging

New Assignments Made for Completing the Work

The two foremen stay with the major units until the old rail has been thrown out and the new thrown in, after which they supervise the work generally. As soon as the men assigned to pulling spikes finish up, they return and help the spikers. When the barring out gang has completed its first assigned duty, it helps out by throwing in the new rail. With the new steel in track, spiked down and all joints closed, the track is released for traffic, the flagmen called in and the block cleared. The forces are then re-assigned as follows:

1 man look-out or whistle man
3 men drilling bond wire holes
1 man distributing oak tie plugs
1 man placing and driving oak tie plugs
3 men adzing ties
3 men installing new tie-plates
3 men lining rail. (Foreman in charge)
8 men installing anti-creepers. (Foreman in charge)
14 men full spiking

The signal man follows this force, installing the third bond wire necessary under the Pennsylvania standards.

Under the conditions generally encountered, the preparation of the track, the running in of the new rail, the finishing up, followed by the preparation of the rail for the next day's run will about round out one full eight-hour day. In the instance described, the actual running in of the rail took but 10 minutes from the time the track was broken until it was closed up again and but 13 minutes elapsed until it was released for traffic.

Before the work is completed for the day, all anti-creepers are applied and tie plates installed on each tie and fully spiked. The 130-lb. section rail installed replaced 100-lb. section rail and completed the renewals of the New York division high speed tracks with 125-lb. and 130-lb. rails.

Throwing in the New Rail. Closing Up the Track—Forces Being Redistributed. Finishing Up. Note Men Preparing the Next String

We are indebted to J. H. Harris, engineer maintenance of way, New York; F. D. Davis, division engineer; and L. J. Fairbank and T. E. Nestor, supervisors of track, for the information contained in this article.

FIRE IN BURLINGTON OFFICES.—The Chicago, Burlington & Quincy suffered from a disastrous fire on March 15 when its 15-story office building in Chicago partially succumbed to a conflagration which broke out and entirely consumed an adjacent city block. Almost directly in the path of the fire and separated from the burning block only by an 80-ft. street, the heat was of sufficient intensity to penetrate the windows of the building and set the contents of the various offices on fire. The contents of the upper seven floors of the building were entirely destroyed and considerable damage was done to the lower floors by water. The building frame was not injured.

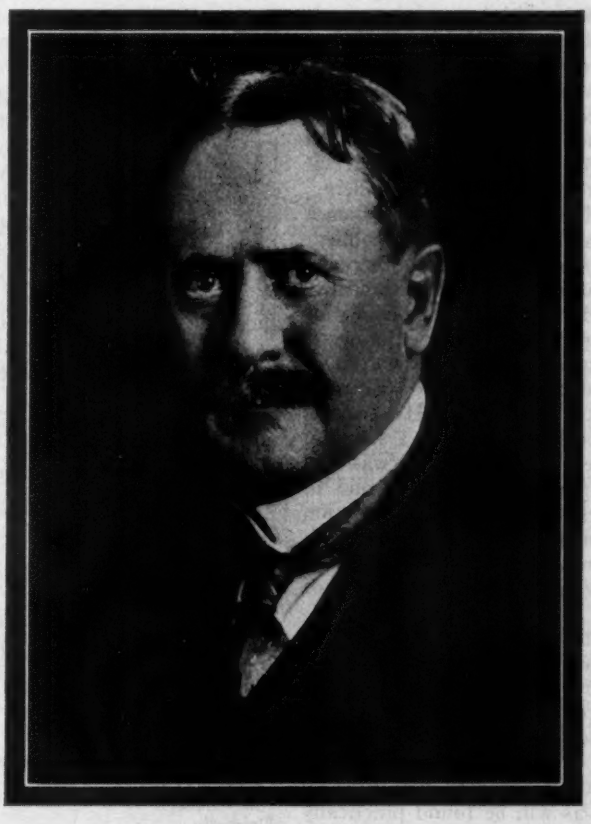
Is There a Real Opportunity for the Draftsman?

President Finley of the Chicago & North Western Demonstrates that Promotion Is Not Closed to Him

BY WALTER S. LACHER

DOES THE draftsman's compass point the way to promotion? Is there a chance for the office man? An answer to these two questions will be found in the career of William H. Finley, president of the Chicago & North Western, who spent most of his early days over the drafting board.

This is entirely out of line with the generally accepted idea of training for railway presidencies. But presidents are no respecters of precedents, and in Mr. Finley's case nearly all the rules have been broken. He had no college education, yet he advanced in a branch of engineering that offers the least opportunity without it. He was for many years a bridge engineer, an office man with little direct field experience. He was never employed in any department save that of engineering; he was never a general manager or a vice-president. Yet today he is the president of one of the great railroads of the United States.



William H. Finley

President, Chicago & North Western

Mr. Finley is inclined to deprecate his handicap in education.

"My career," he said, "started at a time when there were not nearly as many technical graduates available as there are today and when individual initiative perhaps counted for more than it does now. All that training can do for a man is necessarily limited, since no amount of training can increase the number of convolutions in his brain. What a man makes of himself is what he succeeds in accomplishing with the material at his disposal."

Mr. Finley went to work in the engineering department of the Edgemoor Iron Company at Wilmington, Del., as a boy in 1881. Later he obtained an opportunity to enter the drafting room, where by persistent study he overcame the lack of technical training and developed into a proficient structural designer.

"The office man," he said, "must make every effort to overcome one handicap of his position—the limited opportunity which it affords him for meeting others, or for learning to get along with people. This is an important asset in any line of work and a man owes it to himself to develop his ability to deal with others. The influence of those with whom you constantly come in contact also has an important bearing on your character. I was particularly fortunate in this respect in my work at Edgemoor, because it gave me an opportunity to be associated with a number of young men who later made their mark in the engineering and business world. Among these were George H. Pegram, now chief engineer of the Interborough Rapid Transit Company of New York; Onward Bates, consulting engineer, and for a long time a railway contractor; John E. Greiner, consulting bridge engineer, and Charles W. Bryan and Otis E. Hovey, chief engineer and assistant chief engineer, respectively, of the American Bridge Company."

In 1887 Mr. Finley went west to become a designer in the bridge department of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., where he was again thrown in contact with Mr. Bates, who became associated with the St. Paul about the same time and served for many years as the engineer and superintendent of bridges and buildings of that road. Five years later an opportunity for a distinct advancement came to Mr. Finley when he was offered the position of bridge engineer on the Chicago & North Western under E. C. Carter, chief engineer. He continued in that position for eight years, being subsequently advanced to principal assistant engineer and later assistant chief engineer until 1914, when he succeeded Mr. Carter as chief engineer.

"Success," said Mr. Finley, "is to some measure dependent on the accidental. Advancement comes to the man who happens to be in line when the vacancy occurs. However, unless this man has fitted himself to take on the added responsibilities that go with the new position, he will not progress very far."

"Your work as a draftsman and a designer must have kept you pretty close to the office. How did you overcome the lack of field experience?" he was asked.

"At the Edgemoor Iron Company I sought every possible opportunity to get out on the work. At Milwaukee I did the same. Whenever there was an accident or any trouble at any of the bridges I made it a point to get out and see the thing myself."

Interest outside of the channels of daily employment is

necessary for any one and especially so in the case of the office man. Mr. Finley as a young man manifested that state of active mind which is characterized by great interest in a variety of subjects, not only in railway matters outside his own department, but also in public affairs and politics. By displaying a sincere and open-minded interest in the problems of others, he was able to win their sympathy and confidence and thus broaden the scope of his knowledge outside the sphere of his own usefulness. This, of course, was of inestimable value to him in gaining a broad knowledge of railroading.

"In my opinion, success is founded largely on the efforts which a man makes to extend the scope of his usefulness and to his capacity and willingness to accept responsibility. Every one has come in contact with draftsmen who are disinclined to do anything but the work definitely laid out for them. They fail to appreciate entirely the fundamental opportunities which we enjoy in this country. During my employment at Edgemoor and later, I have come in contact with quite a few graduates of foreign technical schools. It has been my experience that these men, as a rule, do not develop as fully as the average American born engineer and I am inclined to believe that this may be explained largely by the fact that they were denied a certain advantage which accrues to the young man brought up in this country as a result of the spirit of individual initiative which prevails here."

Few men in the higher railway positions have taken a greater interest in the welfare of the young engineer. Democratic of habit, Mr. Finley has always been ready to hear the problems of the young man. This sympathy for the subordinate was no doubt the motive behind his connection with the American Association of Engineers, an organization which owes much to him for the counsel and administrative assistance which he gave it during the time he served as a director and officer. His election as president of this association gave that body a standing which it had not previously enjoyed and which was also reflected in a pronounced increase in membership and an enlarged scope of its activities. In return, his connection with the association has given him a closer contact with young engineers than that enjoyed by the average engineering executive. His views are, therefore, worthy of special consideration.

"It is an unfortunate fact that every drafting room contains a number of men who are inclined to embrace radical ideas or who are restive under the conditions imposed on them and are constantly talking of their "rights." These men overlook the fact that the United States is the one country in the world which offers the most to the individual. In this country we have no stratification of society such as will be found practically everywhere else, even in England. It is, therefore, unfortunate that certain organizations founded on the assumption that all men are alike have come to exert a great leveling influence which tends to suppress individual incentive and set up class distinction. The idea that all individuals should be treated alike, irrespective of ability or industry, is wrong, for even in the trades we find a great difference in the ability of individuals."

Mr. Finley believes that a man should develop the capacity for detail. He himself always has been able to carry an enormous load of detail work. Capacity for detail implies an ability to dispose of matters quickly, to reach decisions instantly. A skillful designing engineer, Mr. Finley sees the salient features on a drawing at a glance. When called upon to make a decision he has a faculty for singling out the facts essential for a definite conclusion and if these are at hand the decision is forthcoming at once. If, on the other hand, one or more of them are missing, their absence is noted with promptness.

"An ability to analyze intricate problems correctly," said Mr. Finley, "will be developed through technical training, but in my opinion the technical schools make a mistake in going into too great detail instead of confining their work to fundamentals. If a young man is well grounded in the fundamentals he should have no trouble in developing an ability to grasp the details of the more intricate problems later."

"Railway transportation offers a growing opportunity for the engineer. In the past and even at present, railway operation is largely a matter of rule of thumb. This is not said in criticism since it could not be otherwise, but transportation is now rapidly becoming a well developed science and as this tendency continues it will open a growing field for the employment of the technically trained man. Since the days when I entered the Edgemoor Iron Company the growth of engineering has been truly remarkable and when it is considered that here in America we have a country of equal opportunity for all we can readily appreciate that there is nothing to hold us down except our own limitations."

Tropical Woods for Cross Ties

TO THE maintenance officer, probably the most conspicuous way in which railroads in one section of the country differ from those in other sections is in the kind of ties used. In one section practically all ties will be fir, in another oak, while in others will be found a variety of more or less familiar woods, treated or untreated with preservatives. The reason for this naturally arises from the economy, within reasonable limits, of using those woods native to the locality through which the road passes. It is only to be expected from this that those roads operating within or near tropical regions will be found using tropical varieties of woods for cross ties and that these woods will be found to differ greatly from those with which maintenance men in the greater portion of this country are familiar. In view of this many will find interesting the following information contained in an account by H. J. Schrieber, assistant general manager of the Cuba Railway, of the wood used in that country for cross tie purposes.

As might be expected, the cross ties are obtained almost entirely from hardwoods, of which the following are considered suitable for such purposes:

Arabo
Acana
Almandrio
Caiguirran
Caoba Cerillo
Chicharron
Doncella
Fustete Guaba
Gunu Colorado
Guayacan Negro
Jiqui China
Jucaro Negro
Moruro Jocuma Amarillo
Pito
Quiebra Hacha
Roble Guayo
Sabicu
Tengue
Yaba
Yana
Yanilla
Yamaguey

While the woods mentioned cover the field, Mr. Schrieber states that the best results are obtained from the following in about the order named:

Jiqui China
Arabo
Jucaro Negro
Sabicu
Caoba
Quibra Hacha
Acana

The life of hardwood ties on the Cuban railroads, Mr. Schrieber states, is exceedingly variable and depends upon many factors, among the most important of which is the time of cutting. Some woods, if not cut at the proper time, require renewing in three years, while others, if properly cut, last upwards of 20 years. On the United Railways and the Cuban Central Railway, at least, the variation runs from 5 years to 25 years, with an aver-

age duration of 11 years, as a result of which the renewals amount to about nine per cent annually. On several lines which have been built 12 years, however, the replacements this year will not run over five per cent.

The ties must be bored for spikes, as it would be impossible to drive them otherwise. No tie plates are required. The ties are adzed on two sides only and the specifications for first class ties require a length of 8 ft. 6 in., a thickness of 6 in. and each tie must show at least 6 in. of heartwood on the adzed surface. The specifications require each tie to be within two inches of being flat and to have no more of a bend or "crook" sidewise than six inches. Also both ends must be sawed. The matter of "crook" in the ties is very important in order to obtain uniformity of track and a rigid inspection is required, as many woods so closely resemble each other as to make classification difficult even to experts in tropical hardwoods. Practically all of the available hardwoods at the present time come from the Camaguey province and are taken in large part from lands which have been exploited of the mahogany and cedar logs and taken over for sugar plantation purposes.

Centrifugal Pumps for Railway Water Service Use*

THE first centrifugal pump was invented by Denis Papin of Hesse, Germany, about 1703 or 1704. This was followed by a centrifugal pump described by Ewbanks as "a straight tube attached in an inclined position to a vertical axis and whirled around by the handle." The invention of this pump is credited to LeDemour, who sent a description of it to the French Academy in 1732.

Principles of Operation

A centrifugal pump consists essentially of an outer shell or casing within which revolves an impeller mounted on a shaft. The water enters the impeller at its center and passes out through the vanes into the casing and from the casing to the discharge pipe. The water enters the impeller at a low velocity but passes out from the impeller at an increasing velocity until it reaches its maximum as it passes out of the impeller. The velocity at which the water leaves the impeller depends upon the speed and diameter of the impeller, form of vanes and area of openings. As the water enters the casing and discharge the velocity is decreased on account of the increased area and is changed into pressure.

The velocity of the water upon leaving the impeller determines the theoretical head against which it may be delivered by the pump. The efficiency and actual head against which the pump will deliver the water will depend upon the design and construction of the pump, particularly with regard to the impeller and diffusion space.

Impellers

The impellers are of two general forms—open and closed. An open impeller consists of radial vanes attached to a hub and disk; the vanes are open at the sides and revolve between the two fixed sides of the pump. In a closed impeller the vanes are carried between two disks. It is apparent that the friction loss must be greater with the open type of impeller, as the water is revolved against the sides of the pump at approximately the same velocity as the impeller. With the closed impeller the frictional loss is confined to the water passing through the vanes and to the impeller revolving in the surrounding water. Therefore, it is possible to obtain much better efficiency with the closed impeller, and it is generally used in types of pump adapted to railway water service.

The principal friction loss in any type of centrifugal pump is that of the impeller and the friction loss by the open impeller is twice that of the closed impeller. This loss, together with the leakage loss, causes it to be less efficient than the closed impeller type as far as the handling of clear water is concerned. It is, therefore, recommended only for handling large volumes of water at low head and where conditions are such that debris might cause trouble by reason of clogging the smaller passageways of a pump of more efficient design.

The open impeller, volute type, was about the first successful design of centrifugal pump and until the year 1900 it was practically the only pump of this kind in use. Since that time theory and practice have developed more efficient types of centrifugal pumps, particularly the enclosed impeller volute and the turbine type.

Turbine and Volute Pumps

For convenience centrifugal pumps may be divided into two general classes or types: Turbine and volute pumps. Turbine pumps have circular casings and diffusion vanes surrounding the impeller. The function of the diffusion vanes is to reduce the velocity of the water upon leaving the impeller through gradually enlarging passages, efficiently transforming the velocity head into pressure head.

Volute pumps have no diffusion vanes, but have a casing of spiral form, which gradually reduces the velocity of the water as it leaves the impeller, thus serving the same purpose as diffusion vanes in turbine pumps.

The turbine pump is adapted to and used for heads greater than 150 ft. A head of 100 ft. per stage is figured for most satisfactory results with this type of pump, although it is possible to operate against heads as high as 300 ft. per stage by operating pump at a high rate of speed. This, however, is not recommended as good practice.

The volute pump is a low head pump and is adapted to all classes of pumping service for which centrifugal pumps are used. Where the total head is not in excess of 150 ft. it is quite as efficient as the turbine type for low heads and has the advantage over the turbine type that there are no diffusion vanes to become clogged up or require renewal.

Single and Double Suction Pumps

A further classification of centrifugal pumps may be made by dividing them into single and double suction pumps, depending on whether the water enters the impeller from one or both sides. Theoretically, the impeller in a double suction pump is balanced by reason of the water entering from both sides of the impeller, but it has been found in practice that this is not always true, owing to variation in moving parts and other conditions, and it is always advisable to have a thrust bearing. With

*From a report presented by the Committee on Water Service before the convention of the American Railway Engineering Association in Chicago on March 15, 1922.

the single suction pump there is, of course, always an unbalanced condition of the impeller creating an end thrust which should be taken care of by thrust bearings.

The advantages of centrifugal pumps are:

1. Economy as to initial cost.
2. Low cost of maintenance.
3. Less noise than the average pumping equipment.
4. May be operated successfully with inexperienced labor.
5. Failure to open a valve or the sudden closure of valves on the discharge will not affect the pump.
6. Less floor space is required than for other types of pumps of same capacity.
7. Particularly adapted for handling muddy or sandy water with the least injury to working parts.
8. Starting valves, relief valves and air chambers on discharge line or vacuum chamber on suction line are unnecessary.
9. Can be used in series more satisfactorily than any other type of pump.
10. They are non-pulsating and do not cause water hammer in the line.
11. Particularly adapted to use with motors and automatic operation.

The disadvantages of centrifugal pumps are:

1. The necessity for priming.
2. Will not operate if a slight amount of air leaks into the suction line.
3. Other types of pumps are capable of handling higher suction lifts more successfully.
4. Will not operate efficiently where there is a constant variation in the pumping head.

In order to determine the proper size and stage of pump to be used, the following information must be obtained:

Gallons per minute required.
Static discharge head.
Suction head.
Length and diameter of suction line.
Length and diameter of discharge line.
Number of elbows and bends in both suction and discharge lines.
Nature of fluid to be pumped, whether clear or containing much sediment and grit.
Class of power.

From the above can be determined the total net head under which the pump is to operate and this in turn will determine the size of pump and the number of stages for the unit in question.

The number of stages to be used to perform a given amount of work under ordinary circumstances will depend on the total net head under which the pump is to operate, the amount of water to be delivered in gallons per minute, the diameter of the impeller and the speed at which the pump can be operated, based on the power to be used. As a general rule, it is safe to say that with heads ranging from 10 ft. to 100 ft. we can select a single stage pump; for heads ranging from 100 ft. to 200 ft., a 2-stage pump, and for heads ranging from 300 ft. to 550 ft., 3 or more stages will be necessary, depending on the size and speed of the pump.

Power to Be Used

The pump may be operated by an electric motor, an internal combustion engine, a steam turbine or a steam engine. An electric motor may be connected to the pump direct or through a belt drive. A centrifugal pump direct connected to an electric motor makes an excellent pumping unit and will meet practically all pumping requirements owing to the fact that motors of practically any speed can be secured. A flexible coupling should be used in a direct connection of a centrifugal pump to an electric motor. The belt drive is better suited to small centrifugal pumps than to large units.

Centrifugal pumps may be operated by squirrel cage induction motors instead of slip ring motors, as the starting torque is not great. This shows a saving in cost of power unit, as the squirrel cage motor is not as expensive nor as heavy as a slip ring motor. The advantage of direct-connected, motor-driven centrifugal pumps is in the saving of floor space and power transmission losses. High-speed motors are cheaper than low-speed motors and as the centrifugal pump is a relatively high-speed machine there is consequent saving in total first cost.

Internal combustion engines with direct or belt drive are particularly adapted to operating centrifugal pumps, especially for railway water service. Considering power costs alone, they undoubtedly offer the most economical power that can be used, except where the cost of attendance may be eliminated through automatic electric drive.

The steam turbine has proven a satisfactory method of operating centrifugal pumps in some cases, but there are but few points where it could be used in railway water service. By an adjustment of the governor, the speed of the turbine can be readily altered to suit the varied demands made upon the pump.

The use of steam engines for driving centrifugal pumps in railway water service is limited. They can be operated economically only where the exhaust steam is required for other purposes or perhaps where steam is available without the necessity for installing a boiler plant.

Efficient Methods of Installation

To obtain efficient operation a special study must be made of each installation. Conditions under which pumping units operate vary to a considerable extent and no set rules may be laid down to fit all conditions. The following suggestions are offered as applicable to general conditions covering centrifugal installations:

A certified characteristic curve of the pump at the speed recommended by the manufacturers should be furnished and studied carefully, special attention being given the following points:

(1) The effect of a reduction in head without a corresponding decrease in the power exerted.

(2) The efficiency at various heads.

The horizontal, split casing type with enclosed impeller is recommended where conditions are adapted to its use as it presents the most accessible form of construction for inspection and repairs.

The bearings should be of the ring oiling type and provided with drip pockets connected to a drain to carry away the slight leakage that should be permitted through the stuffing boxes and glands.

A flexible coupling should be used on all direct connected units to connect the pump with the prime mover as this type of coupling permits for slight inaccuracies in the alinement of the shafts and insures cool bearings.

A check and gate valve should be placed on the discharge line near the pump. The check valve is to protect the pump from water hammer; the gate valve to regulate the discharge of the pump and to permit its removal without emptying the discharge line.

If a centrifugal pump is required to draw water from a single driven well, the suction pipe should be dropped down inside the well casing and the top of the casing should not be closed but left open, so that the air can have free access to the surface of the water.

The pump should be placed as near to the source of supply as possible, especially when operating with a suction lift.

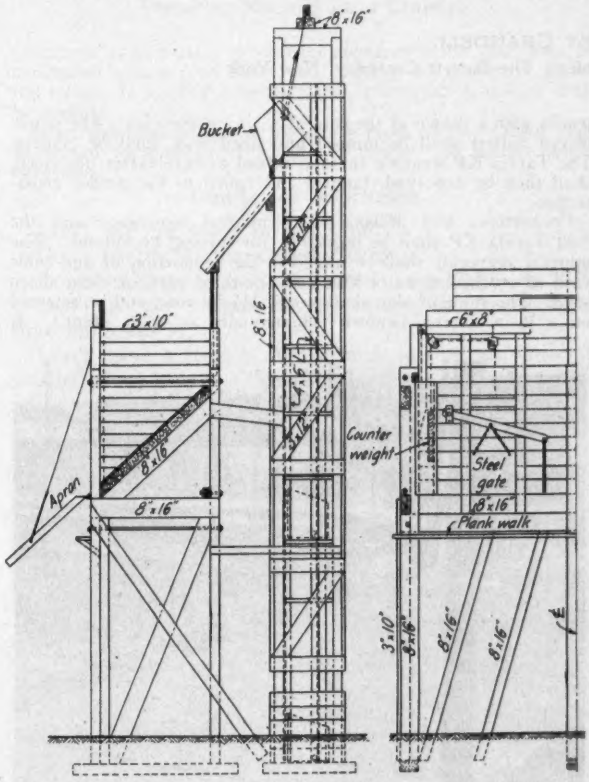
In order to keep the suction line full of water, a foot valve should always be installed on the end of the suction pipe.

The general practice is best represented by the use of pumps belt driven by internal combustion engines using oil for fuel; either the internal combustion fuel oil engine or the electric motor is preferable as power unit, according to the relative cost of fuel and electric current. Transmission other than belting has not been generally used by the railways. The silent chain drive appears to have an advantage in compactness of units and low transmission losses, but is largely offset by excessive first cost for the smaller installations. The use of an indirect connected centrifugal pump usually arises from the necessity of putting the pump within reasonable suction lift of supply and keeping the prime mover, particularly an electric motor, above possible extreme floods.

A Coaling Station Built Entirely of Used Materials

AT BARTLETT, just outside of Peoria, Ill., where the Minneapolis & St. Louis has its eastern terminal yard, this company built a coaling station last year which, aside from a somewhat novel design in coaling station construction, embodies the interesting feature of having been erected by the bridge and building forces almost entirely from second-hand 8-in. by 16-in. bridge timbers.

Only a small structure was required at this point for the reason that the daily consumption of coal did not exceed an average of 30 tons, the road engines, taking enough coal at a main line station about 20 miles away

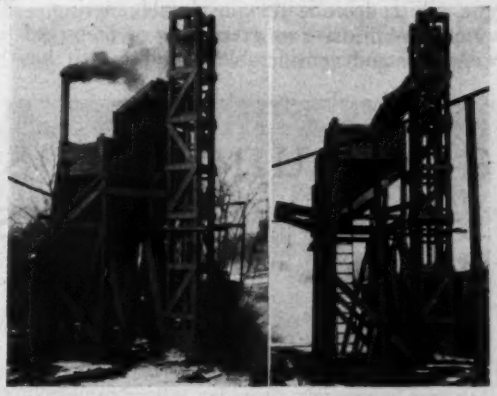


General Details of the Station

to last them until their return to it, thus leaving only the switch engines to provide for. To meet this situation it was first considered sufficient to build only the elevated bin, which, when erected, was filled with coal by a locomotive crane operating a clam shell bucket. When it developed, however, that the clam shell was often not to be had when desired for filling the bin, it was decided to supplement the bin by the tower equipped with a bucket and hoist as shown on the plan.

The bin is about 12 ft. long and 9 ft. high. As shown on the plan, the bottom slopes to the front of the bin and interior sidewalls are present to deflect the coal towards two points of discharge where the flow of coal is regulated by a steel gate operated by a lever accessible to the engineman. Each pocket is also equipped with a steel apron properly connected to a counterweight so that it may be raised into the clear after the loading of the engine. The bucket for the coal hoist is a ¾-yd. iron receptacle so attached to the hoisting rope that when reaching the top, it is tripped into a position permitting the contents to dump into an apron discharging into the coal bin after the manner of more elaborate facilities.

The hoist is operated with an ordinary bridge builders' hoisting engine, the steam for which is obtained from the water station pumping plant in the vicinity. The coal is delivered at the foot of the tower from side



Two Views of the Bartlett Coaling Plant

drop bottom coal cars, which are dumped to the side of the track next to the tower. These cars discharge about two-thirds of the load close enough to the foot of the tower to enable the laborer to transfer it into the bucket without taking more than a step.

No figures are available on the actual cost of handling the coal, as the labor is performed by cinder pit and roundhouse men and the steam is furnished, as above stated, from the adjacent pump house. The opinion is, however, that the coal is handled very economically.

We are indebted to R. G. Kenly, assistant to the president and chief engineer, for the above information.

Jucaro Timber Resists Worms

THE HEARTWOOD of Jucaro piles, made from a species of tree that grows in Cuba, is very resistant to the attacks of marine borers. Extensive experience with these piles on the Key West extension of the Florida East Coast has demonstrated their value. The following report made by P. P. Pierce, assistant engineer to H. N. Rodenbaugh, chief engineer of that road, will give an idea of the nature and the various properties of the Jucaro wood.

Jucaro timber is found in the eastern end of Cuba, two kinds being used for piling, namely, "negro" (black) and "blanco" (white). Of the two the "negro" is the better wood. The wood resembles the shell bark hickory in appearance with a bark much like the burr oak. The heart wood is a dark brown and the sap a light cream color.

The sap will not withstand the action of worms, but the heartwood has been found very resistant against the action of both the teredo and limnoria, as will be seen from the accompanying photographs taken of a section from a fender pile in Key West harbor after seven years' service. It will also be noted that though the sap is honey-combed to a great extent it does not slough off as is the case with pine piling.

To secure the best results from these piling, it is necessary to secure green piles and drive them with as little delay as possible, as the timber decays very rapidly when stacked. Above water the sap is quite prone to rot, but below water rotting occurs so slowly that it is scarcely perceptible. So far as can be ascertained the heart is

very resistant to rot, as is the case with numbers of other tropical woods. However, if the top of the piling is cut off square with a saw and left unbanded, the sun and weather will split the pile in many and long rifts. To overcome this the top should be rounded off and wrapped with several turns of heavy galvanized wire, securely fastened, about six inches from the upper end.

These piling drive with considerable spring. They are not as easy to drive as green pine or creosoted piles, but will withstand considerable pounding. It has been estimated that in bearing qualities it ranks between the Dade County pine and oak. No figures were obtainable.

These piles are very expensive and the price per foot varies considerably with the length and heart. The high cost is due to poor transportation facilities, as they are found in a hilly country quite distant from either railroad or water transportation and have to be handled for a number of miles with oxen. Furthermore, there are only certain seasons when they can be gotten out on account of the weather, which is frequently unfavorable.

Tar Bound, Crushed Stone Crossings Supersede Plank

BY JOHN STANLEY CRANDELL
Consulting Engineer, General Tarvia Department, The Barrett Company, New York

IT IS generally admitted that the plank crossing construction commonly provided where highways cross railroads at grade is far from satisfactory and several attempts have been made to construct crossings with materials that would last longer, require less maintenance and cost less both at first and over a period of years. It is the opinion of the writer that up to the present time greater success has been secured with the tar bound, crushed stone type than with any other.

That the subject is of importance may be judged from the fact that the Committee on Signs, Fences and Crossings of the American Railway Engineering Association was instructed to investigate this subject, and this committee presented a report at the convention in March based on an inspection of 95 crossings. Of these, 21 were of concrete, 57 of bituminous materials, 3 of steel or iron, 8 of paving blocks and 1 of ballast material. Of those built with bitumen, 26 were bound with tar and 22 with asphalt. The tar-bound crossings ranged in cost from 10 cents to 33 cents per sq. ft., while those of asphalt cost from 18 cents to 55 cents. The report went on to state that, of the improved types of crossings, there are more of bituminous construction than of any other, that the first cost of installation is lower, and that they are easily built.

Because the average section gang is not versed in the art of road building, it might be inferred that many mistakes would be made which would result in poorly built crossings, but it is interesting to note in this report that practically all of the bituminous bound crossings are in good condition. As a matter of fact, there have been failures during the past four years from this very cause, yet on the whole the work done has turned out surprisingly well. Another cause of failure has been the use of bituminous material unsuited to the job. The remedy here is obvious. The remedy for faulty workmanship will be discussed later.

At the suggestion of some of the railway engineers of this country, the writer has prepared a specification and a plan for the construction and maintenance of tar bound crossings, together with a scheme for assuring careful and conscientious work. The specification follows:

Specification for the Construction of Tarvia KP Highway Grade Crossings

Preparing Base.—The ballast at the grade crossing shall be thoroughly tamped, and enough additional ballast shall be added to bring it to an even surface at an elevation 2 in. below the top of rail along the rail, and 1 in. below the top of rail along the center line between rails. The ballast shall be laid between tracks with a crown at the rate of ½ in. to the foot. The newly placed ballast shall be tamped and filled with sand or cinders. The Tarvia KP wearing surface, mixed as hereinafter described, shall then be deposited, tamped and rolled to the proper cross-section.

Proportions and Mixing.—The mineral aggregate and the cold Tarvia KP shall be measured for mixing by volume. The mineral aggregate shall be mixed in the proportion of one cubic yard of crushed stone or slag and one-third yard of clean sharp sand. The stone or slag shall pass a 1¼-in. ring, and be retained on a ¼-in. screen (known commercially as ¾-in. stone). It

A Tarvia Crossing at Detroit

shall be clean and dry when used. The stone or slag shall be mixed with from 16 to 18 gal. of Tarvia KP, and when the stone or slag is thoroughly coated with the Tarvia the sand shall be added and the mixing continued until every particle of the aggregate is coated with Tarvia. The mixing may be done mechanically or by hand. The Tarvia concrete mixture shall then be stored to cure for a period of at least five days before using. It shall be protected from the rain, and it shall be left uncovered during good weather to permit of thorough curing.

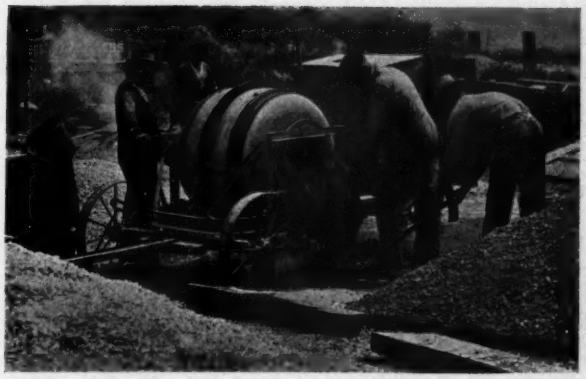
Flangeway.—A flangeway may be provided as shown in the drawing.

Hand Mixing.—When mixed by hand, all of the Tarvia concrete shall be mixed on a clean metal or wooden platform.

Storing.—In all cases the Tarvia concrete shall be stored on a clean metal or wooden platform.

Depositing.—Upon the roadbed as described above, the cured Tarvia concrete shall be deposited in sufficient quantity to bring the finished surface to grade after compacting and rolling.

Spreading and Rolling.—The Tarvia concrete shall be raked



A Mixing Plant on the Chicago, North Shore & Milwaukee Preparing Material for a Crossing

evenly so as to present a uniform appearance. It shall then be compacted with a road roller until there is no movement under the roller. If a roller is not available a heavy iron tamper shall be used.

After the final rolling or tamping a layer of sharp sand shall be spread to a depth of ½ in., to protect the surface while hardening.

Don'ts for Workmen

Don't use wet stone or wet sand.

Don't use dirty, clay-covered stone.

Don't mix stone and sand and then add Tarvia KP.

Don't use a fresh mix if you can help it. Aging for a time improves it.

Don't leave a freshly mixed batch in the rain without a waterproof cover. The mix does not become waterproof until cured.

Don't heat Tarvia KP in open tanks or in kettles over open flames.

Don't mix Tarvia KP with very hot stone or sand.

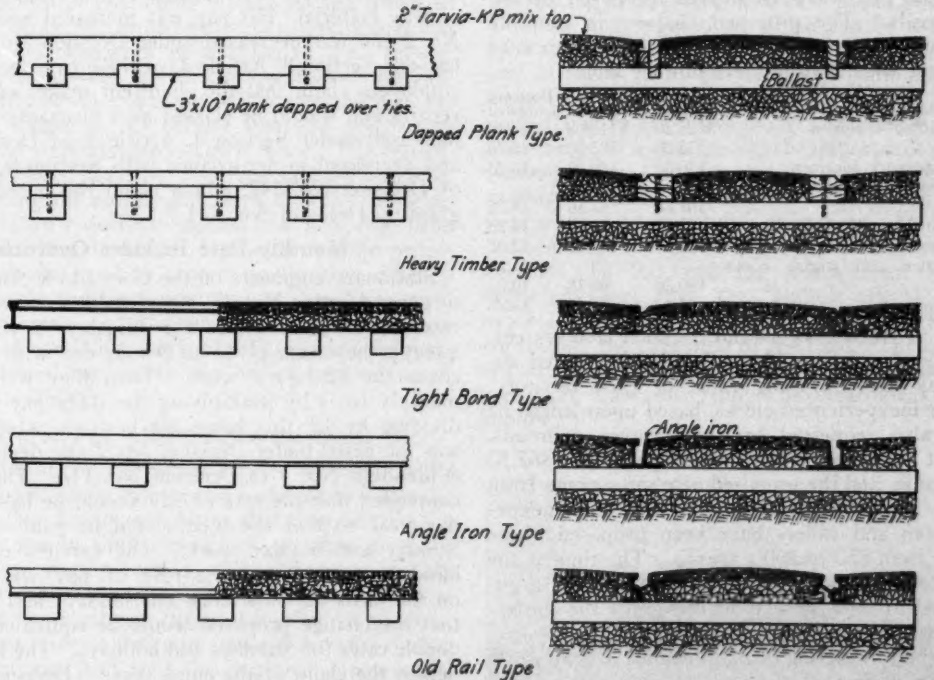
Don't forget to see that all spikes, splices, tie plates, etc., are in good condition before laying the pavement.

The Tarvia "KP" mentioned above is a coal tar product that is fluid at ordinary working temperatures. It consists of a heavy, solid tar binder to which is added just enough solvent to make it a fluid. The solvent soon evaporates after the mix has been made, leaving the tar firmly bonding the mineral aggregate of the mix.

If the specification is followed a good job will result, but it has been found that while there is a disposition to follow in a general way, that there are some engineers and track foremen who are likely to overlook some seemingly unimportant details, with consequent unhappy results. To guard against failure, a scheme of supervision has been devised which provides that some responsible railroad man shall be instructed and trained in the art of constructing these crossings, and that no crossings shall be built without his supervision or the supervision of some one trained similarly. The company supplying the Tarvia does the initial training.

A Crossing After One Year's Service

If there is much work to be done, a small concrete mixer will prove economical. Some roads prefer to mix up a large batch at a central point, shipping the mix to the crossings as required. Others do the mixing at each individual crossing. In this case, it is usually cheaper to mix by hand, and the mixer may be dispensed with. A more uniform mix is assured when a mixer is used,



Various Types of Flangeways

although very satisfactory work may be done by hand mixing. Two men can handle the entire work, but it is more expeditious to use an extra man. Even where a large amount of material is to be mixed, it is seldom advisable to have more than five men and a foreman at work.

On large jobs it pays to build the mixing platform above the level of the gondola car so that the mix may be easily carted from the platform to the car. Care must be taken not to dump the mixed material off the car into mud or rubbish. The mix must be kept free from foreign matter. If possible, no material of any kind should be delivered at the crossing until the crossing is ready to be built.

The maintenance of such crossings consists in patching any holes or breaks with a mix similar to that of which the crossing was constructed, and following with a light treatment with "Tarvia B." The usual treatment is an application of from ¼ to ½ gal. per sq. yd. After two hours or more, the tar is covered with pea gravel or ¾ in. stone chips, which serve as a cover, becoming imbedded in the tar. This grade of Tarvia is fluid at ordinary temperatures and is used as a surface treating material, rather than as a binder. Crossings will probably need surface treating a year after they are built. The treatment is solely a maintenance measure, and puts the crossing in shape to carry it through another year or more. The small amount of material used makes such treatments very inexpensive.

Vibration may cause a slight breaking up of the mix where it is laid against the web of a rail. The remedy is to make a mastic of tar and sand in about equal proportions and pour this mixture into the ravelled area, which usually is directly along the rail. If there is any difficulty about pouring the mastic, the sand should be warmed before mixing with the tar.

Grade crossing construction such as described here is no longer in the experimental stage. Many of the trunk lines have built and maintained such crossings successfully. Among the roads that have constructed tar bound crossings in the past year are the Baltimore & Ohio, the Pennsylvania, the Nickel Plate, the New York Central, the Michigan Central, the Duluth, Missabe & Northern, the Chicago & North Western, the Lake Erie & Western, the Erie, the Delaware, Lackawanna & Western, the Pere Marquette and several interurban electric roads.

Activities of the Labor Board

HEARINGS on proposed wage cuts were started by the United States Railway Labor Board on March 7, the crowd present being so large that it was necessary for the board to obtain a large hall in which to conduct its business. Although the proceedings before the board thus far have been confined entirely to the shop crafts, exhibits have been made of tentative wage reductions for other employees, proposed by the western railroads. The proposed changes in monthly wage rates concerning members of the maintenance of way department are shown in the following table:

Class of employees	Present Wage	Proposed New Rate	Decrease Requested
Bridge and building foremen	$125.20	$115.00	$10.20
Assistants	115.20	105.00	10.20
Track and maintenance foremen	110.20	100.00	10.20
Storekeepers, clerks, 2 years or more experience	101.78	87.50	14.28
Clerks, less than 2 years' experience	87.50	73.22	14.28
Stationary engineers (steam)	120.20	108.18	12.02
Stationary firemen and engine room oilers	100.20	90.18	10.02
Callers, gatemen, etc.	93.62	79.34	14.28

In the case of track laborers and common laborers employed in various capacities the railroads have asked authority to pay the prevailing rates in each territory. New rates for inexperienced clerks, based upon length of service, are also requested by the western railroads. Under present rates these employees are paid from $67.50 to $77.50 a month, and the proposed new rates range from $50 to $70 a month. Similarly, new rates for inexperienced gatemen and callers have been proposed, these rates ranging from $50 to $60 a month. The time at the hearings thus far has been taken up primarily by arguments designed to show defective conduct of the conferences between the roads and the men.

Interest in the contracting of maintenance of way work, which was the subject of the hearing before the board some time ago, is being revived by the announcement by Vice-Chairman Hooper that the board would soon render a decision on the cases. These involve the Erie, the Indiana Harbor Belt, the New York Central and certain other lines who were charged with violation of of the Transportation act in the contracting of maintenance of way and equipment work to outside firms.

The following are some recent miscellaneous decisions of the Labor Board concerning minor cases relating to maintenance of way employees:

Is a Chauffeur a Mechanic?

The Terminal Railroad Association, St. Louis, employs a chauffeur on a motor truck to transport maintenance of way material. His pay was increased under Decision No. 2 and was decreased under Decision No. 147 on the basis of Section 8, Article 3, of these two decisions. The employees claim that the chauffeur makes certain minor repairs and should be classed as a mechanic and his pay increased under Section 4, Article 3, of Decision No. 2, and decreased in accordance with Section 9, Article 12, of Decision No. 147, which claim the board refused to grant. (Decision No. 711.)

Monthly Rate Includes Overtime

Stationary engineers on the Colorado & Southern prior to general order No. 27, Supplement 7, were paid daily rates covering 12 hours for 365 days a year. Subsequently they were given an 8-hour day with overtime to cover the 12 hours' work. Then they were put on a monthly basis by multiplying the daily pay by 365 and dividing by 12, this being the basis on which their pay was increased under Decision No. 2 and decreased under Addendum No. 1 to Decision No. 147. The employees contended that the rate of pay should be based on a 306 day year so that the men would be paid overtime for Sunday and holiday work. The carriers on the other hand contended that the rate of pay was established on the basis of work done on Sundays and holidays, so that the change proposed would be equivalent to paying double rates for Sundays and holidays. The Labor Board denied the claim of the employees. (Decision No. 717.)

Foremen Need Not Be on Duty with the Men

A question was raised with respect to coal dock foremen on the Chicago & North Western in a case brought before the Labor Board by the American Brotherhood of Maintenance of Way Employees and Shop Laborers. The foreman was instructed on March 6, 1920, that he

would not be required to work on Sundays or holidays and would work only 9 hours on working days, whereas the men employed under him worked 10 hours daily, including Sundays and holidays. It was the contention of the employees that the provisions of Supplement No. 8, to general order No. 27, prohibited changes in the number of days per month of monthly paid employees, that in consequence the foreman must be permitted to work the same number of days and hours as previously. The railroad contended that Supplement No. 8 of general order No. 27 was superseded by the National agreement with the Brotherhood and that there is nothing in this agreement to require a man to be employed in excess of 8 hours on week days and that his duties do not require employment in excess of the time specified on March 6, 1920. The board sustained the contention of the railroad. (Decision No. 713.)

Pumper Not Entitled to Overtime

A pumper on the Atchison, Topeka & Santa Fe was placed on 10-hour assignment and compensated on a monthly rate arrived at by adding to the monthly rate applying to eight-hour service the amount accruing in overtime for the ninth and tenth hours of regular assignment. Occasionally, he has been compelled to work in excess of the 10 hours and has turned in time slips accordingly, but the railroad has refused to pay him overtime on the ground that his monthly salary compensates for all service rendered. The decision of the board is that the case does not indicate that the duties of the person in question were such as to place him on an hourly basis in accordance with the exception obtained in the last paragraph of section (a-12), Article V, of the maintenance of way agreement. (Decision No. 769.)

Seniority of Men Possessing Less Skill Than Others

The Delaware & Hudson, in order to reduce expenses, laid off a number of coal chute employees and arranged to have their work performed by certain mechanical employees who did this work in addition to their regular duties. The employees discharged questioned the railroad's authority to do this because some of the men removed were longer in the service than the mechanical employees who were assigned to their work. The contention of the railroad was that the men laid off were incapable of doing the mechanical work done by the other men. The board's decision is that the seniority rules were not violated by the carrier, but holds that the seniority rules were designed to protect senior men when a change was made and therefore provides that the railroad shall hold conferences with the employees' representatives with a view to providing work for the senior employees if they are found reasonably capable of performing it. (Decision No. 780.)

Unnecessary to Pay All Foremen the Same Rate

Bridge and building and water service foremen on the Portland division of the Southern Pacific made a submission to the Labor Board, requesting that they be paid the same rate as men in similar positions on other divisions of the Southern Pacific System. The present inequality in rate of pay came about through the fact that the Portland division, or Southern Pacific Lines north of Ashland, Ore., was under a different regional director during government control and that this regional director did not advance wages on a parity with the advances granted on the Central Western region, which embraced most of the other lines of the Southern Pacific System. As a result, the advance in wages under Decision No. 2, whereby the increases were applied to the rates in effect on March 1, 1920, served to perpetuate the existing differential. The employees requested that this inequality be removed, but the railroad contended that the increase in wages was applied strictly according to Decision No. 2 and that the present rate is, therefore, correct. The decision of the board is that the provisions of Decision No. 2 had been complied with in applying the increase. It states, further, however, that the decision is not to be construed as preventing negotiations between the railroad and its employees with regard to the salaries paid these foremen. (Decision No. 798.)

Employee Must Be Capable

A carpenter on the Lehigh Valley who had been employed at bench work was later assigned to repair work on a coal trestle. After five days' work he laid off and several days later reported to his foreman that he was not physically able to do the heavy outside work and asked to be reassigned to the bench work. The railway denied this demand on the ground that there was not sufficient work of that kind to warrant his employment exclusively on it and on a reduction of force he was definitely laid off and a younger man in the service retained for the regular roustabout work of the bridge and building gang. The representatives of the railroad stated that this man was unable to perform this class of work safely and efficiently and that he was very clumsy and that, further, the seniority provisions of the agreement give the railroad the right to determine whether or not the employee is capable. The Labor Board sustained the railroad, but recommended that when forces be increased the man be re-employed on work he is capable of performing. (Decision No. 799.)

Cash Prizes for Ideas

THE management of the Fort Smith & Western, a 200-mile railroad in Oklahoma, has issued a circular announcing to employees that cash prizes are to be offered for ideas and suggestions which can be used to enlarge upon the efficiency of operation of the road. The circular says in part: "Any old-fashioned plant can continue to make money when business is flourishing, but in these times the most expensive modern equipment will not save any enterprise which ignores the importance of the human element and the elimination of unnecessary cost. Your employer must be able to make ends meet in order to pay your wages and meet other obligations. Conditions make it necessary that economy be practiced to its utmost detail." To this end the management suggests that every employee from the "highest official down to the office boy" submit whatever useful ideas he may have concerning the operation of the road. The employees are not limited to any department in their observations and are made their own judge of what ideas they should submit.

Sodding Slopes in a Cut

Laying Membrane Waterproofing

How Membrane Waterproofing Is Laid

An Explanation of the Methods of Application, Materials, Equipment and the Gang Organization

By A. S. HARRISON
Vice-President, Minwax Company, Chicago

THE IMPORTANCE of the proper application of waterproofing materials can hardly be overemphasized. Next to proper design, it is the controlling factor in initial watertightness, for while materials may assist effective workmanship, inefficient application can render the best materials valueless. It is the purpose of this article to set forth the main facts as to application which have been demonstrated by a number of years' experience in this field.

The use of men experienced in this class of work is essential for the most efficient results and will usually be found the most economical. The contracting of the work to firms specializing in membrane waterproofing, whose organizations are trained and equipped, will, in most cases, be most satisfactory. A clear distinction should be made, however, between experienced waterproofing contractors and those concerns doing only roofing work. The superintendent or foreman should always be experienced in the particular class of waterproofing undertaken, if the full efficiency of the materials used is to be developed.

An understanding of the basic characteristics of the materials for membrane waterproofing is essential to a detailed consideration of their application, etc. The membrane system of waterproofing consists of layers of saturated cotton fabric, felt, or burlap, laid in and cemented together with waterproofing asphalt or coal tar pitch and built up on the work to form a continuous blanket (mat or membrane) more or less completely surrounding or blanketing the structure to be waterproofed.

A two-ply membrane should consist of two piles of fabric (felt or burlap) and three full moppings of waterproofing, asphalt or pitch, a three-ply membrane of three of fabric and four moppings of asphalt, etc. There is considerable variation in practice as to the number of plies which should be used under any given condition, based on the type of material employed as well as the opinion of the engineer or architect. However, the number of plies most widely accepted as standard practice for average waterproofing conditions appear to be 2 ply for an asphalt saturated cotton fabric membrane, 5 ply for a felt and asphalt or pitch membrane, and 3 to 4 ply for a burlap and asphalt or pitch membrane. These in all cases presume a satisfactory surface on which to apply the membrane (to be discussed below) and reasonable working conditions. Where both of these conditions do not prevail, a waste course may be necessary to prepare the surface or extra plies may be added for extra insurance of efficient workmanship. The reasons for the marked difference in the number of plies involve points beyond the scope of this article.

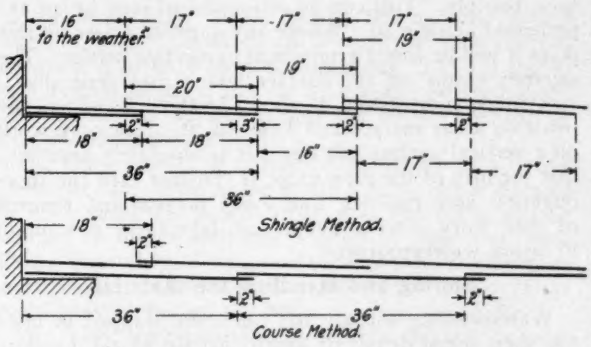
Kind of Surface Important

The character of the surface upon which the waterproofing is to be applied is of the utmost importance. It can be of any construction material which produces a sound, durable surface having the following characterstics: It should be clean and free from grease, dirt and dust and all loose material, and should be dry at the time of application. It should be smooth and firm, free from projections or pits which might cause puncture. For a concrete it should be a wood floated or smooth formed surface, and for brick, a well laid and pointed surface. In steel plate construction, all rivet heads should be covered with sand and asphalt mastic for best results, and where wood is used, a smooth, well laid surface should be provided. The application to wood in contact with soil is not generally recommended, but can be accomplished successfully under certain conditions.

With the best of waterproofing asphalt, "priming" the surface with a thin asphalt paint is not necessary, although with most types of asphalt and pitch a primer is recommended and should always be used. On excessively dusty or frosted surfaces it will serve to hold the fine particles, which act to prevent complete adhesion. The character of the "primer" is of the utmost importance because of its tendency to volatilize under heat and cause gas bubbles. It should be such as will dry rapidly and completely and should not form a heavy skin on the surface.

In actual application there are two methods which are efficient and generally used. The first method, generally accepted as standard, is the shingling or continuous method, and the second, the course or layer method. Both build up a continuous blanket and meet the general requirements for efficient installation. Each, however, has characteristic advantages and limitations that affect its adaptability to various types of work.

In the shingling method two-ply installation is built up by first laying a half-width sheet of fabric or felt, followed by a full-width sheet which should completely cover the first; the third sheet should then lap the second one-half its width plus two inches, and the fourth and each succeeding should lap its predecessor one-half its width plus one inch. Assuming a fabric of 36 in. width, the procedure would be to swab 18 in. of surface and place a half sheet of fabric (18 in. wide), rubbing it well into the hot asphalt. Swab this fabric and an additional 18 in. of surface and place a full width of fabric (36 in.), lapping the full width of the first sheet. The third should be full width and should lap its predecessor 20 in.,



Two Methods of Laying Membrane Waterproofing

the section of the fabric and surface immediately under it having first been swabbed. The fourth and each succeeding sheet should lap its predecessor 19 in., the swabbing having been applied as before. Over this the final swabbing is applied. This produces full two ply with a two-inch lap, accurately and without wastage. The most convenient and efficient manner for building the blanket under field conditions will be described later under the handling of materials. The lap can be checked from the width of the exposed or "weather" portion of the sheet. The width of this should be one inch less than one-half the width of the sheet, or 17 in. for a 36-in. sheet, save for the first sheet, where it should be 2 in. less than half. The sheets should always be started at the low point. At the end of the sheets the laps between mats and between floor and wall courses, etc., should be at least 12 in. and particular care should be taken to see that the seal here is perfect.

A three-ply installation, according to this method, should be started with a sheet of one-third width, the second should be two-thirds full width and the third full width, both lapping the full width of the first. Each succeeding sheet should lap its predecessor two-thirds of its width plus one inch—this produces full three-ply with a three-inch lap.

Membranes of four and five ply are usually built up as two ply and two ply or two ply and three ply.

The Course Method

A two-ply application of the course method is built essentially as follows: Swab the surface and lay a full width (36 in.). The second sheet and each succeeding one should be full width, lapping its predecessor two inches, the surface to be covered having first been swabbed.

This builds up the first course or layer. The second course is built up in the same way and laid directly on the first, but is started with a half sheet (18 in.), so that the laps come in the center of the sheets of the first course. Sheets should be started at the low point. The sheets for the second course should be of such length that their end laps will come at least 36 in. away from the end laps of the first course. These end laps should be at least 6 in.

The shingling is the more widely used. It builds the completed mat at once, cuts down the amount of walking which must be done on the waterproofing and presents a heavier, more rugged mat to withstand the necessary traffic. It is somewhat more economical both as to material and labor.

On the other hand, the course method allows the breaking of the end laps and an interweaving at the junction of the floor and wall work that makes for efficiency. The chief disadvantage is that on floor work the first course or ply must be walked on in laying the second, with consequent danger of injury and a slightly increased cost. If there is any choice it would lead to the shingling method for floor work and the course method for wall work, laminating under and over the floor mat.

One-ply work is laid exactly as the first ply for the course method, except that the sheets should be lapped 3 in. instead of 2 in. and end laps should be 9 in. instead of 6 in. One ply is not recommended, but can be used as damp-proofing.

Where an extra ply is being used, it is recommended that it be applied as a separate operation so that there shall be a standard membrane—two, four or five-ply—acting independently. When used as a waster, such additional ply should be applied directly on the surface and when applied as additional insurance, the ply or plies should be installed on top to seal laps, joints, etc.

Materials

The computation of quantities of materials for waterproofing is usually based on a unit area of 100 sq. ft., which is termed a "square." The quantities required will vary considerably with the type of surface, whether

A Kettle

rough or smooth; its temperature; the temperature of the material, etc., but particularly will depend on whether the surface is vertical or horizontal, for the wastage in mopping a vertical surface is considerable. Quantities will also vary with the type of membrane—felt or fabric—and to some extent with the type of bitumen. This last can, however, be disregarded. The following have been found fairly accurate for estimating purposes:

Bitumens (Asphalts or Coal Tar Pitch)

(Per Mopping—Per Square)

	Smooth Surface (Good Weather)		*Rough Surface* (Cold Weather)	
	Horizontal	*Vertical*	*Horizontal*	*Vertical*
On concrete or fabric	35 lb. 4 gal.	40 lb. 5 gal.	45 lb. 5½ gal.	65 lb. 8 gal.
On felt	15 lb. 2 gal.	35 lb. 4 gal.	25 lb. 3 gal.	50 lb. 6 gal.

In the case of membranes (fabric or felt), the actual area to be waterproofed plus 10 per cent for laps and wastage, multiplied by the number of plies to be installed, gives the quantity of material required. In fabrics this is usually computed as 12½ sq. yd. per ply per "square" of surface; for felts, usually 108 sq. ft. per ply per square. No difference need be made for vertical or horizontal surfaces, but all flashing, unusual laps, etc., must be taken into consideration.

Proper Tools Are Essential

The equipment will be considered from the basis of a one-gang organization. It can be multiplied in any part to meet the size of the development. It should consist of a kettle, dipper, carrying buckets, mopping buckets, mops, brooms and an axe.

Typical Mops

The kettle can be of any sort of a roofers' or tar kettle, but one which has sides which form a fire box, cover and flue opening, will be found most convenient. One of 100-gal. capacity is usually most convenient on the average job. The kettle should be clean before it is used and as all tars and asphalts tend to form a cake in the bottom, it should be cleaned at frequent intervals. Care should be taken in the selection and setting up of the kettle to allow plenty of fire space, for a good even heat is essential to a supply of uniform material. The dipper is long handled and usually of about one gallon capacity.

The carrying buckets can be pails of any character—12-qt. is a convenient size. They can be bought at any roofing supply house. There should not be less than two for each gang or mopper. The mopping bucket is considerably larger—10-gal. capacity—so that the asphalt will hold the heat longer. It is an important item of equipment.

The mops are most important, for they affect both the efficiency and the speed of the work in much the same way that the quality and character of the brush affects a painter's work. They can be bought ready made or mop yarn can be bought and the mops made up in the field. Even with experienced men, however, the cost of the mop made in the field (considering its life) is more and made up mops will be found an economy. When not in actual use a mop can be kept soft or softened by hanging it over the edge of the kettle, but it should never be left in the kettle, as it will be burned quickly. One mop will last to swab about 1,500 sq. ft. of surface, two ply.

Only a Small Gang Is Required

The usual waterproofing gang consists of from four to six men, depending upon the nature and conditions of the work. One mopper, two helpers or fabric men, one kettle man and, if necessary, one sweeper, who also helps carry the hot asphalt, unroll the fabric, etc. No attempt will be made to more than sketch the duties of the various men, for it must be realized that no instructions, however detailed, can be substituted for actual experience.

The mopper is the important man in the organization and his efficiency controls both the speed and efficiency of the work. He should be experienced and is usually foreman of the gang. In many cases it will be found economical to use two moppers, so that longer sheets can be handled efficiently.

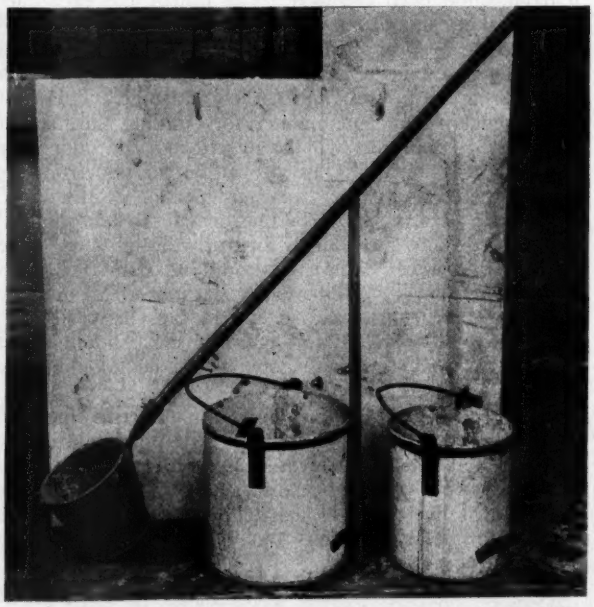
The helpers or fabric men handle and place the fabric or felt on the surfaces as they are mopped. They also unroll the fabric, cut sheets, etc. For wall work, the number of helpers can usually be reduced to one.

The kettle man should start the fire under the kettle two hours before work begins, keep up the fire and carry hot asphalt. The asphalt should be at a temperature of from 300 to 325 deg. F., pitch should be heated slightly less. It will require a good fire, well maintained, to produce sufficient heat. Considering a 100-gal. kettle, it will require about two hours to heat a full batch of asphalt. By refilling the kettle as each pailful is drawn off, between 300 and 350 gal. can be heated during the day, or sufficient for from 2,000 to 3,000 sq. ft. of surface, two ply. This can be accomplished only by an experienced kettle man. Where any question arises on this point it will be found economical to use two kettles. The sweeper cleans off the surface and assists generally.

A single gang should do about 2,500 sq. ft. of two-ply work on a flat surface and 1,800 sq. ft. of two-ply work on a vertical surface per day. It is absolutely necessary that the men of the gang exercise constant care and thoroughness and, realizing that every portion and element of their work is to be put to test, take every precaution to insure waterproofness.

Storing and Handling the Material

Waterproofing asphalt and pitch are shipped in open top sheet metal drums of approximately 55 gal. capacity or in wooden barrels of 40 to 50 gal., weighing from 400 to 500 lb. It can be stored in the open by simply standing the drums on end. It will be found convenient to place them as close to the kettle locations as possible.



A Dipper, a Mopping Bucket and a Carrying Bucket

In using the material, the bottoms of the drums should be chopped off with the axe and the sheet metal cut through for the full length of the drum and stripped by sharp blows from the axe. The asphalt or pitch should then be chopped in convenient sized pieces for putting in the kettle.

In heating the material, care should be taken not to heat it above 350 deg. F. If the kettle should catch fire, it should be smothered by covering it thoroughly. If the fire is put out immediately, fresh asphalt should be put in to cool the mass, which will still be in condition for use,

but if the fire burns long the contents of the kettle must be thrown away, as they will have been spoiled by overheating. The fumes or smoke given off by the asphalt become a brown and dirty yellow when the temperatures range near the flash point and when these are seen fresh asphalt should be added at once or the fire partially drawn. A fire of waste lumber is usually used, but coal or oil burners are efficient on large operations.

The operation of mopping is extremely simple and the only precautions are to see that the mop is sufficiently full so that it flows easily and that it is swung with the laps and not across them. For the final swabbing the asphalt had best be poured on the surface and spread with the mops.

Asphalt saturated cotton fabric, felt and burlap are shipped in rolls. Cotton fabric is usually 36 in. wide, and is packed in 50-yd. rolls, weighing about 50 lb. It should be stored under cover and the rolls placed on their sides. They should not be stacked over five deep if this can be avoided, nor stood on end.

The fabric should be unrolled with the aid of a device similar to that shown in the figure. Nails in the ends of the stick make the best bearings, but the sticks can be rounded or driven out, and a piece of pipe used as a shaft. The fabric will require some pull in unrolling, as any medium for lessening the adhesion between layers would prevent the perfect lamination of the blanket.

The fabric can be handled in many ways, but the most common is to cut it into sheets of convenient length; 20 or 25 ft. is about right. After the first half width sheet is laid, these are folded in half, lengthwise. The full length of the surface is then mopped for this half width, after which the folded sheet of fabric is placed in this and the remaining half width of surface swabbed, following which the upper fold of fabric is turned down into it.

With the shingling method, the folded second sheet should be placed directly on top of the half sheet, and the folded edge of the third sheet should be placed not less than two inches in from the inner or covered edge of the second sheet, while the folded edge of the fourth and each succeeding sheet should be placed not less than one inch in. This method will insure satisfactory and efficient results in spite of variations in the width of the sheets. Care must be taken to have the two swabbings overlap to form a continuous coating. If the fabric men will handle either end of the sheet and the mopper handle the center, little difficulty will be had from wrinkles on flat surfaces. For vertical work it is usual to make loose rolls of the sheets and, starting at the top, roll the fabric into the swabbing.

Felts are usually packed in rolls containing 324 or 435 sq. ft. or three or four squares, and the grade most used for waterproofing is a 14-lb. felt, that is, 14 lb. to the square. Because of the character of the saturating material, there is usually no adhesion between rolls. It can be handled as described for fabric, omitting the unwinding device, or the surface can be mopped full width each time and the felt pulled out and dropped in the mopping.

Burlaps are usually handled in the same manner as cotton fabrics, except that usually an unwinding device is unnecessary, as talc or wood pulp is used to prevent adhesion.

Only one other point requires attention. That is the protection of the waterproofing blanket after it has been laid. Membrane waterproofing will be cut if carelessly subjected to abrasions. It should be protected against backfill or careless workmen by a mortar coat or brick course, or by installing the mass concrete promptly. All traffic should be kept off it before the protection coat is applied. There is no economy in careless treatment.

Freak Sleet Storm Hits Wisconsin Roads

ONE OF THE most remarkable and disastrous rain, sleet and snow storms in history traversed the states of Minnesota and Wisconsin on February 21 and 22. Across the northern portion of the state the precipitation consisted of snow and in the southern part of rain, but in a belt about 40 miles wide it was in the form of sleet, which left a coating of unusual thickness that caused enormous damage to railroad property. The Chicago & North Western, the Minneapolis, St. Paul & Sault Ste. Marie and the Chicago, Milwaukee & St. Paul and other roads in this area suffered heavily. The following abstracts from a report by O. H. Frick, district engineer of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., give an interesting picture of this storm.

South of a line extending from Random Lake through Horicon and Portage to Viroqua, the incessant rain falling on bare frozen ground collected quickly in the small streams, dislodged the ice and brought it down rapidly, endangering many of the railroad bridges, and with most severe results on the Prairie du Chien division west of Madison, and the entire Mineral Point division.

North of this area, however, and south of a line extending from Green Bay westerly across the state, the rain turned into a sleet storm with very disastrous results. On the Superior division practically the entire telegraph line between Random Lake and Greenleaf went down, the telegraph poles being either broken off at the ground or, if standing, were stripped of the wires and cross arms. The rain practically froze where it hit, with a peculiar result. The dry grass in the fields and on the right of way appeared as icicles about 2 or 2½ in. thick and standing straight up from the ground to a height of 2 ft. In some places barb wire fences carried a solid sheet of ice about 2 in. thick, extending from the top wire to the ground, and where any telegraph wires were hanging to the cross arms at all they were encased in a solid coating of ice fully 2 in. thick, with a sheet of ice on the lower side 6 or 8 in. long. It is said that a telegraph wire with the ice on it was found to weigh 2 lb. to the lineal foot. Between Chilton and Green Bay the rain froze into the track between the rails, so there was a solid sheet of ice the entire distance. In fact, a resident of Chilton skated on the ice between the rails from Chilton to DePere and gave the division officers at Green Bay the first information they had of a crew working from the east opening up the line. For most of the distance it was actually necessary to pick the ice away from the head of the rail, as flangers and other equipment of that kind could not be used, and as the work was necessarily slow, that portion of the Superior division was closed to traffic from the night of February 22 until February 25.

One peculiar incident in connection with the storm was the sending of a wireless message from some place near Medina, on the Soo line, stating that an engine was off the track and asking the division headquarters at Fond du Lac to send out the wrecker. The wireless message was picked up by the government station at Milwaukee, telephoned to the Northern division dispatcher's office of our line and forwarded from there to Iron Ridge, from which point it was then sent by freight train, which was the first train through to Fond du Lac, and given to the Soo Line division officers. This was the first word received at that point concerning the derailment.

While it is not an unusual occurrence to have a sleet storm in the area affected at this time, nothing so severe has ever been known and the financial loss incurred by the railroads and public utilities was enormous.

WHAT'S THE ANSWER?

This department is an open forum for the discussion of practical problems of maintenance of way and structures. Readers are urged to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. The *Railway Maintenance Engineer* also solicits the co-operation of its readers in answering any of the questions listed below.

The following questions will be answered in next month's issue:

(1) Where a pump is required to operate against considerable head, as in forcing water through a mile or so of pipe, trouble often arises in getting the pump started or in preventing the blowing out of joints, etc. How can this difficulty be avoided without extensive changes in the equipment?

(2) How can short line kinks be kept out of stone ballasted track?

(3) How can one determine readily whether objectionable quantities of loam or other impurities are present in sand to be used in concrete?

(4) Is it better to end the foundation wall of a frame building with the bottom of the first floor joists or should the wall be carried up around the joists to the floor level?

(5) Can a rail be cut in two with from three to five blows upon the cutter when the cut is not near the end of the rail? If so, how?

(6) How should galvanized iron be prepared for painting?

(7) What rules should govern the installation and design of gas engine exhaust pipes and exhaust pits to secure the best combination of engine efficiency and safety from fire?

(8) How can sway bracing be applied to creosoted pile bents without cutting into the piles to take up irregularities in their size or position?

The Three Most Important Factors in Track Maintenance

What are the three most important factors in good track maintenance and which of these should be given first attention to secure the most satisfactory results from the others?

First Answer

The three most important factors in good track maintenance are drainage, line and surface, with line the most essential. J. J. HESS.

General Roadmaster, Great Northern, Seattle, Wash.

Second Answer

In my opinion, the vital maintenance features of Class A track are: (1) Good drainage, (2) good track material, which includes ballast, and (3) good line and surface. I think that good drainage is the most important thing that we have to deal with in our track maintenance, because with even an inferior grade of track material better tracks can be maintained with good drainage than if we had first-class material and poor drainage. A. C. BRADLEY,

Division Engineer, Chicago, Rock Island & Pacific, Chicago.

Third Answer

The three most important factors of good track maintenance are line, surface and gage. In determining which of these three are most important, there have been many lively discussions. However, in my opinion, one is equally important to good riding track as another. It is customary to gage track during the winter months when one cannot line or surface and a good plan when gaging the track in winter is to spike line at the worst places, especially in stone ballast, where it is difficult to line out and hold out against short kinks. G. L. GLOVER,

Roadtrain Foreman, Michigan Central, Galien, Mich.

Fourth Answer

The three most important factors in good track maintenance are, in my opinion, drainage, surface and alinement. Drainage should be given first attention with the other two factors in the order named. Alinement consists of both line and gage and neither can be secured satisfactorily without a good surface on which to work. Good surface depends largely upon drainage. It is understood, of course, that the material in the track is in good condition to begin with. V. H. SHORE,

Section Foreman, Atchison, Topeka & Santa Fe, St. John, Kan.

Fifth Answer

I believe drainage, ballast and ties to be the three most important factors in track maintenance in the order named. As is well known, water is the worst enemy of track. If it was not for moisture in the track, the cost of

maintenance could be cut 50 per cent. In the second place, good ballast is very important. Money spent surfacing track on poor ballast is practically thrown away. Ballast is absolutely essential to good track. In the third place, the track must be supplied with first class ties to insure safety and a good riding condition, as the stability of the whole structure depends on the tie, provided there is good drainage and ballast. P. CHEEK,
Supervisor, Illinois Central, Springfield, Ill.

Comments substantially the same as this were also received from R. E. Donaldson, section foreman, Atchison, Topeka & Santa Fe, and T. J. Murphy, supervisor, Chicago Junction, Mr. Murphy making the additional suggestion that tight bolts should not be forgotten as an essential in good track.

Sixth Answer

The three most important factors of good track are surface and line, drainage and gage, assuming that the material in the track is in good condition, bolts tight and spikes driven down. The surfacing and lining of track should be done first, as track that is slightly out of gage, well surfaced and with rail in good line will ride fairly well. By slightly out of gage I mean up to ½ in. wide, as we assume that any gage wider than that does not exist on well-maintained roads. As surfacing and lining progress, track should be dressed to standard section with all water removed as soon as possible after storms. Gage should then be corrected, using care when adzing ties so as not to spoil the surface on the gaged rail. Having attended to that portion of track work it is well to clean the ditches to standard section, for good track cannot be maintained unless it is well drained. F. SCHAUBLE,
Assistant Supervisor of Track, Boston & Albany, Pittsfield, Mass.

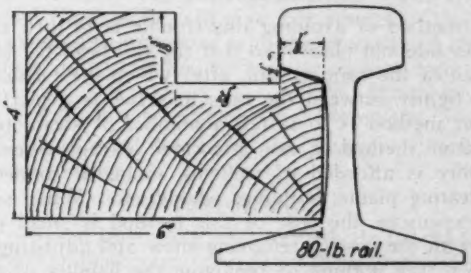
Preventing Snow From Packing Under Plank Crossings

Where wood plank is used between rails at platforms or street crossings suggest a practical plan to prevent snow from being packed in the flangeway and then, due to passing wheels, being driven under the first plank, with the result that the plank is forced up above the top of the rail.

First Answer

This is a matter that has received a good deal of attention from the Chicago, North Shore & Milwaukee (Electric), as, on account of the nature of the equipment and the very short headway between trains, this road gets excessive pressure due to the train movements crowding down and packing the snow before the flangers can get over the road to throw it out. To overcome this, and at the same time to overcome the hazard (that we have found to be a very real one) of horses and pedestrians catching their feet in the flangeways, we have developed the method of forming this flangeway, as shown in the illustration. The work is very simple, consisting of taking the end plank to the shop and cutting out a section 2⅛ in. wide by 1⅜ in. deep. This operation is easily performed and when these planks are ready to be installed they are adzed under the rail so as to fit up snugly, as shown on the section.

Since adopting this method we have had no trouble with planks being forced up by the snow. It is true, however, that we have adopted a method of using somewhat more care in laying our crossing planks. We are now using cheap 4 in. by 6 in. heart maple plank for our crossings. These are seasoned in the yards and given the open vat grade one creosote treatment before sending them out on the road. We have made it the standard policy, when installing a new crossing, to change out practically all the ties so that we have assurance that the ties are sound under the crossing plank. We also have made it standard practice to use sawed ties at these locations, and the tamping of these ties is given special care, our section men being instructed to put up the track at these crossings, so that there will be no need of resurfacing for a long while. We have also made it the standard practice



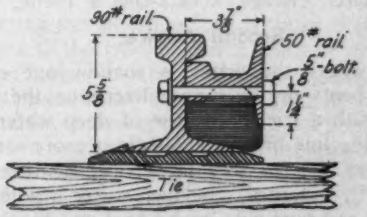
A Plank Formed to Go Under the Rail Head Is Held Securely

to eliminate all joints in the crossings. To accomplish this, we have put in stock a limited amount of 66-ft. rail, and if a joint occurs in the crossings two rails are removed and the longer rail is substituted at the time the crossing is renewed.

Crossing planks are put down by the bridge men instead of by the section crews, and are put down to stay. Then, after the crossing is laid, the bridge men fill the joints and cover the surface with a coal-tar preparation and sand. If the location is such that it can be done easily, we prefer using a hot tar preparation for this treatment, but when that cannot be accomplished, we have at times used a prepared product that can be applied cold. This method insures a well-built crossing, which cannot be forced up by the packed snow, and the additional expense involved in placing crossings in this permanent fashion is offset by the longer life and less maintenance required. JESSE S. HYATT,
Engineer Maintenance of Way, Chicago, North Shore & Milwaukee, Highwood, Ill.

Second Answer

The sketch given below shows a guard rail we have installed in plank crossings and also in macadam paved crossings which acts as a flangeway and prevents dirt or snow from crowding under the planks or macadam. The



Another Form of Flangeway

use of a rail in this fashion is quite common, but we have made the guard rail more positive in its position by drilling bolt holes and bolting the guard rail securely to the running rail. H. B. MOORE,
Roadmaster, East Bay Electric division, Southern Pacific Lines. Oakland, Cal.

Third Answer

A method of avoiding trouble of this kind is to bevel the edge of the plank which is next to the rail so that it

will fit snugly against the rail web, the bevel extending back far enough and deep enough to act as a flangeway. Care must be taken in removing the beveled edge plank, however, to avoid breaking it. For this purpose a start should always be made on the side away from the rail.

G. L. GLOVER,
Roadtrain Foreman, Michigan Central, Galien, Mich.

F. W. Hillman, Chicago & Northwestern, offered substantially the same suggestion.

Fourth Answer

One method of avoiding this trouble is to turn a rail upon its side and place it so that the rail head fits under the head of the running rail, after which the planks are placed tightly between the rails to serve as a platform. Another method is to install a number of steam pipes. The latter method is not advocated except when the possibility is afforded of utilizing steam in connection with heating plants, buildings, shops, etc. While seemingly expensive, the cost of this method is small compared with the cost of removing snow and adjusting the planks, to say nothing of removing the liability of accidents occurring.

J. J. HESS,
General Roadmaster, Great Northern, Seattle, Wash.

Taking Soundings Around Trestle Bents

What is the most practical way of taking soundings around trestle bents and bridge piers to guard against scour?

First Answer

My experience with washouts on streams in the southwest, including New Mexico, Oklahoma and Texas, has led me to believe that there is no best means. At its crossing of the South Canadian river the Rock Island has had one of its greatest troubles in bridge maintenance. This is true of practically all of the bridges of all of the railroads that cross this river from Logan, New Mexico, to Arkansas. When this river comes up it is a practical impossibility to get any soundings whatsoever, as the entire bed of the river moves with the water and the current is so swift and the water so thick with sand that it is a practical impossibility to get any information. On the south fork of the Cimarron river we have had similar trouble, but there the current is not so swift and we have used rods and gages on the batter piles of some of the bents. In this way we could keep track not only of the rise in water level, but also ascertain where piers were scouring and where breakage could be expected.

A. C. BRADLEY,
Division Engineer, Chicago, Rock Island & Pacific, Chicago.

Second Answer

In cases where the water is shallow one can wade around the bents or piers and determine the scour by measuring with a stick. In case of deep water one can use a sounding line or pole. A pole is more satisfactory in swift water, not too deep, as vertical measurement can be more easily obtained. In deep water a pole becomes cumbersome and unwieldy, and a lead and line are necessary. It is quite a trick to take soundings with a lead and line in swift running water as the lead is carried down stream. One must throw it up stream and be quick to catch it in a vertical position and be sure it is on bottom and no loose line out. I have done such work in 100 ft. of water in the Mississippi river when it was running so that two strong oarsmen could not row a boat up stream. Soundings should be taken above and below the bents or piers as well as next to them so as to detect any approaching scour. A raft or boat can be used, depending on the current. Soundings should be taken periodically and platted so one can have a graphic representation of the action.

F. W. HILLMAN,
Division Engineer, Chicago & North Western, Chicago.

Why Tie Plates Have Shoulders on One Side Only

Why are tie plates made with a shoulder on the outside only instead of on both sides?

First Answer

A shoulder on the inside of the tie plate has no effect on the rail whatsoever and consequently is an added expense because of the extra metal.

A. C. BRADLEY,
Division Engineer, Chicago, Rock Island & Pacific, Chicago.

Second Answer

Tie plates are made with a shoulder on the outside only to hold the track to gage. As the rail shoves outward and not inward, it is not necessary to have a shoulder on the inside.

T. J. MURPHY,
Supervisor, Chicago Junction, Chicago.

Third Answer

Tie plates have a shoulder on the outside to help hold the track to gage by giving more bearing surface to the outside base of the rail, to help hold the plates squarely on the tie and partly to eliminate throat cutting of the spikes, also to assist in keeping the tie from sluing. There is no perceptible advantage in having a shoulder on the inside of the plate, while if the tie slues to any extent it will cause either the inside shoulder or the outside to move partly under the rail base, thereby holding the rail off the plate. With one shoulder the plate will generally adjust itself to the rail as the tie moves or slues.

V. H. SHORE,
Section Foreman, Atchison, Topeka & Santa Fe, St. John, Kan.

Fourth Answer

The shoulder is placed on the outside of tie plates only, instead of both sides, for the purpose of resisting the side thrust in the outward direction and to prevent widening of the gage. There being no inward action of this kind, the only benefit to be derived from a shoulder on the inside would be to insure placing of the plates at right angles with the rail and to act as a possible preventive of track creeping, the theory being that when side action occurs the shoulders would act as a wedge when the tie became slued to such an extent as to bring the corners of the shoulders in sharp contact with the rail. The most serious objection to the use of two shoulders aside from the additional expense would be the uselessness of the inside shoulder if it was desired to repunch the plate for a lesser width of rail base.

J. J. HESS,
General Roadmaster, Great Northern, Seattle.

Fifth Answer

There is only one reason for a shoulder on a tie plate and that is to keep the rail from spreading; it does this by the shoulder holding against the rail flange whereby it employs the holding power of both the inside and outside spike. As rails never shift toward each other, a shoulder placed inside would only be an inconvenience.

G. L. GLOVER,
Roadtrain Foreman, Michigan Central, Galien, Mich.

Keeping Paint Brushes Soft

How should paint brushes be cleaned when they are not to be used for some time?

There are several methods that give good results. For brushes that are to be used again in the same kind of paint I find that wrapping them very carefully in paper

after they are filled with paint has a tendency to preserve them and keep the bristles soft. Brushes may be cleaned with benzine, turpentine, or some good patent brush cleaner and laid away with the bristles carefully straightened out. Some painters fill the brushes with some harmless oil or vaseline.

BERT E. DARROW,
Master Painter, Atchison, Topeka & Santa Fe, Kansas City, Mo.

Roofs for Water Tanks

What are the advantages of a roof on a water tank other than for frost prevention?

First Answer

It is advantageous to install a roof on a storage tank where the water is not only used for locomotives, but as a drinking water supply, as the roof will prevent the collection of dust, soot, etc., in the tanks. As a fourth feature it may be stated that a roof on a cylindrical tank, if properly installed, will help materially in keeping the tank in shape and prevent bulging at the top. I think the most important advantage of the top on the average storage tank for railway service, however, arises when the water in the tank is lowered in preventing the drying out of the tank before it is again filled. By the use of a top the staves are kept moist until the tank is refilled, thereby preventing the warping or cracking which cause leaks. Furthermore, where looks are to be taken into consideration, I think a tank with a top certainly has a more finished appearance.

As we are not materially troubled from frost or the freezing of tanks on the Southern Railway System, however our standard for storage tanks does not include a roof, as we feel that the advantages derived as mentioned above would not warrant the expenditure for the roof and its maintenance. It would seem, however, that the jocular statement that the only advantage of a roof on a tank is to keep out the rain is not entirely well founded.

A. B. PIERCE,
Engineer Water Service, Southern, Washington, D. C.

Second Answer

Aside from that affording protection from frost, which makes the roof and ceiling so essential in northern latitudes, the roof is necessary to prevent the accumulation of leaves and other debris flying in the air which, being carried along with the water, is liable to cause trouble in the valves, especially at water columns. A roof also prevents the growth of certain water fungi which thrive in open tanks and makes a water undesirable for use in locomotive boilers.

In any other than an extremely wet climate, or in a location where there is a gravity supply to keep the tank full at all times, the roof on a wooden tank is also essential to prevent the drying out and shrinking of the upper two or three feet of the tank staves and by protecting the staves from the weather the roof also prevents decay to a large extent, thus prolonging the life of the tank a number of years.

EDWIN M. GRIME,
Supervisor Bridges and Buildings, Northern Pacific, Fargo, N. D.

Killing Vermin in Bunk Cars

How can vermin in bunk cars be killed?

First Answer

Vermin are a source of great trouble, not only to occupants, but to those who endeavor to eliminate them. One great trouble is that the vermin do not always originate in the cars, but are carried in by new occupants. Many attempts have been made to steam cars. This, however, while killing the live vermin, seem to hatch out the eggs, and unless followed up very soon to kill the new batch the situation is as bad as before. This method is rather expensive, as the cost of an engine is high. We have had good results from a machine which generates a gas from tablets furnished by the maker of the machine. This will not kill the eggs, so that it is necessary to follow the first application in about ten days in order to get the newly hatched vermin before more eggs are laid. We have made three or four tests with this machine with very satisfactory results. There are washes and powders which if applied consistently will give fair results. Occupants of cars should be impressed with the necessity of keeping cars clean and airing the bedding and clothing frequently.

F. W. HILLMAN,
Division Engineer, Chicago & Northwestern, Chicago.

J. J. Hess, Great Northern, also advocated the use of the steam treatment.

Second Answer

There are at least three efficient methods for the killing of vermin in bunk cars. One is by the use of sodium or potassium cyanid gas. Under this method one ounce of the cyanid is used to each 100 cu. ft. of air space and in the ratio of 1 oz. of cyanid, 1 oz. of sulphuric acid and 3 oz. of water. The liberated gas is extremely poisonous and should be used only by responsible people having knowledge of its properties.

The second method is that of using carbon disulphide. This substance is a liquid which volatizes at low temperatures. The gas is heavy and should, therefore, be placed at the top of the room. It is used at the rate of one pound to 100 cu. ft. air space. Because of its extremely explosive character it must not be used near a fire.

A third method is that of superheating the cars in midsummer to a temperature of 125 deg. Fahrenheit. This is probably the simplest and most effective means of eradication.

In the methods given it is necessary to close all cracks and crevices completely and keep the cars closed for at least 12 hours. Fumigation is always more effective when the air is moist and the temperature is relatively high. Bed bugs are easily controlled by the fumes of burning sulphur (1 pound to 1,000 cu. ft.) and local applications of benzine or kerosene.

H. H. STAGE,
Entomologist, St. Louis Southwestern, Texarkana, Ark.

Installing Stoves in Frost Boxes

What rule should govern the installation of a stove in a frost box?

In answering this question it is assumed that the query has reference to the frost box of a roadside or other elevated water tank. As the question suggests, there are several instances where stoves are used in conjunction with such tanks to prevent freezing. Some manufacturers, in fact, have established special designs of tanks to meet such conditions. Except, however, for the few locations where a stove is absolutely essential even if an extra man must be carried on the payroll to keep the stove burning, such installations are not to be recommended.

Assuming that the stove could be installed to eliminate fire hazards, there is still the very practical consideration that a stove cannot be installed and the frost box maintained air tight at the same time. It is highly important that a frost box, to be effective, be maintained air tight. Otherwise, little is to be gained from the expensive construction ordinarily represented by the frost box with its air spaces and multiple walls. Of course, where the stove is kept burning constantly there would arise no need of

such construction, but it is in this very respect that the usual stove installation falls down. It is one thing in water supply service to have a plan under which a certain operation is to be performed and another to have the plan carried out as it must to be effective. The average water tank is usually located at some distance from a town and often a long ways from the pump house, especially in the winter. The ordinary stove is hot one minute and cold the next and it is seldom that the average attendant can be relied upon to keep the stove burning constantly under the conditions that are usually present.

At a terminal point, where several men are available to look after the operation of the stove without necessitating added expense such a plan might be effective, but at such places the better plan, if such heating is absolutely necessary, is usually that of extending a steam or hot water line from the power plant or other point into the frost box.

At the outlying points on the line, however, the problem is usually to be solved most effectively by establishing an absolutely airtight frost box of proper construction and of instructing the pumper to keep the water in the riser pipe in motion. This he can do by pumping a little water into the tank at frequent intervals. As a general rule, therefore, it may be stated that a stove should never be installed in a frost box of a water tank unless no other method of preventing freezing will suffice and unless adequate provision is made to keep the stove burning.

Second Answer

In a cold climate, at a tank where water is taken but once or twice a day, some method of artificial heat must be resorted to if the water station is to be kept in operation during the winter months. Where the water is secured from a well, lake or reservoir, its temperature will vary between 35 and 50 deg. F. and if an ordinary lantern is kept burning in the frost chamber it will usually prevent freezing. Such a lantern should have a fount sufficiently large to hold a 24-hour supply of oil. Small oil stoves, such as refrigerator car heaters, are sometimes used for this purpose, but they consume more fuel and frequently will go out on account of lack of sufficient air to support combustion. On the whole, the lantern is the more satisfactory and economical.

Where water is secured from a river, the temperature during the winter is close to the freezing point and if the water is used infrequently as at many branch line stations, the best method to keep it from freezing is to install a coal stove in the frost chamber, using, in place of ordinary stove pipe, a wrought iron pipe extending directly from the stove up through the frost chamber, through the tank and up beyond to a point several feet above the roof.

With sheet iron protection on the front chamber in the vicinity of the stove and continuous wrought iron stove pipe the fire risk is reduced to the minimum. This wrought iron pipe is made tight at the tank floor and held in place by companion flanges bolted together.

With this plan in use, if a good fire is maintained in the stove for several hours, at periods two to five days apart, depending on the severity of weather conditions, very satisfactory results may be secured at rather small expense.

The above refers to tanks of wood construction. Steel tanks, which usually have a water leg of large diameter, do not freeze readily unless no water is taken for an extended period. Wooden sheathing, providing three dead air spaces, built around the water leg will usually give sufficient protection for this type of tank so that no artificial heat is required. EDWIN M. GRIME,

Supervisor Bridges and Buildings, Northern Pacific, Fargo, N. D.

A Further Answer to Query 2 In the February Issue

It has been my experience that it is good practice to require foremen to have a fixed system of handling motor, lever and push cars. We have a safety rule book that brings out fully just how this should be done for the best interests of safety and promotion of the work.

The best method of handling motor and lever cars is to run them at a moderate rate of speed, training the men to watch for obstructions, to maintain a lookout to the rear and front for approaching trains, and unless they have a line-up from the dispatcher, to take the necessary steps to flag. In starting the car it should always be pushed off from the rear and the men should never be allowed to sit on the floor and let their feet hang over the sides.

The most experienced men in the gang should always be placed at the front of the car and should be fully instructed in regard to preventing tools from working off the car, which might cause derailments. All tools should be placed on the car in a systematic way and laborers should be trained to load and unload them quickly without injury to themselves or fellow workers. There should be a thorough understanding between foremen and laborers as to each man's place in removing the cars from the track. Last but not least, the foreman should operate the brake himself. L. W. TURNER,

Roadmaster, Seaboard Air Line, Andrews, S. C.

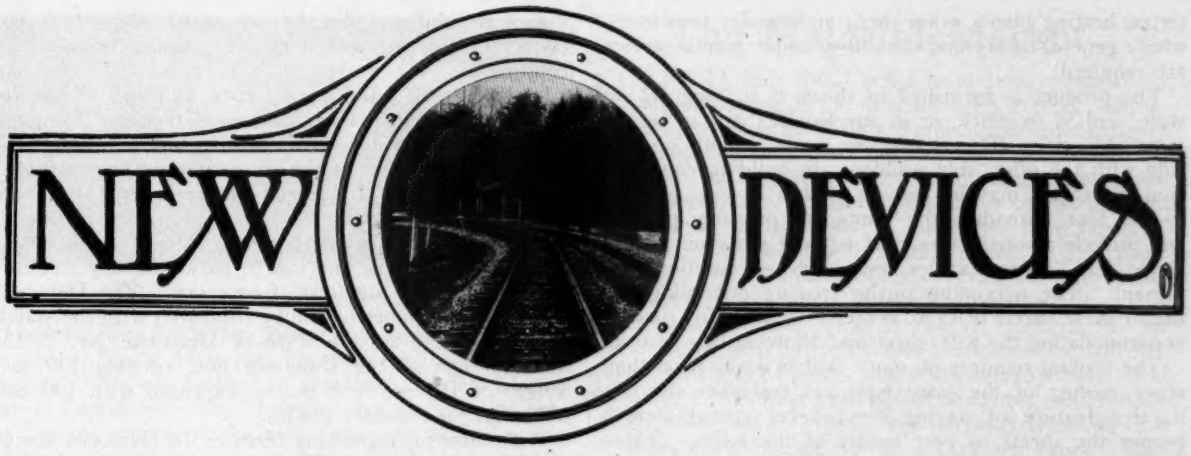
Driving Up Expansion

In the November issue there was published among other queries the following: "What is the most practical method of driving back the rail to close up expansion openings?" An answer to this query was published in the January issue. Since that time a contest was held on the Southern Pacific in which the prize winning article, written by J. W. Reddick, section foreman, Ennis, Texas, dwelt on this point. The method given is rather out of the ordinary and seems to possess considerable merit. As a further comment on this query, therefore, it is reproduced below.

"In driving up expansion with an eight-man gang, I find I can get the best results by using two men flagging, two men with claw bars removing joint spikes and spikes on the first tie ahead of the joint that may come in contact with bars, and four men with push car with a 30-ft. rail suspended beneath the car by chains which hold the rail six or eight inches inside the wheels and two or three inches clear of the roadbed and ties.

"To prevent the rail sliding in the chains, drill two holes in the web of rail, using two track bolts through the links of the chain. In order to fasten the chain to the frame of the car, remove one board from the bed of the car. At the point of driving remove the inside spikes on a few ties to permit moving the end of the rail six or eight inches, raising the end of the track rail to a level with the end of the driving rail, and holding it there by placing a common angle bar under it.

"By using this method more power is obtained from 4 men than can be had from 12 men by the old method and double the amount of rail can be driven per day. To avoid battering the rail a steel plate may be used, with clamps to bolt to end of track rail. This method is not recommended for two or three rails, but is an excellent method of driving for a day or more. Shims of proper thickness to secure the desired expansion should be used. Bolts should be tightened and joints spiked as soon as possible in order to hold expansion."



A Positive Highway Crossing Sign

FOUR YEARS' experience with red glass mirrored reflectors has demonstrated their effectiveness as warning signals, particularly for highway crossing signs. The reflector throws back light from the lamps of automobiles and other vehicles in the form of a powerful red glare that is sure to attract attention. The properties of the signal are derived from a unique form of construction embodying the use of a pot colored, laminated glass and a polished nickel brass plate, making a combination that forms an efficient reflector. Both the glass and the polished metal surface are provided with an undulated or multi-plane surface, which serves to diffuse the light thrown upon the sign so that a strong reflection is obtained at a considerable angle, each way from a perpendicular to the plane of the signal. A positive indication is, therefore, obtained by vehicles anywhere within the width of the highway.

A Positive Crossing Sign

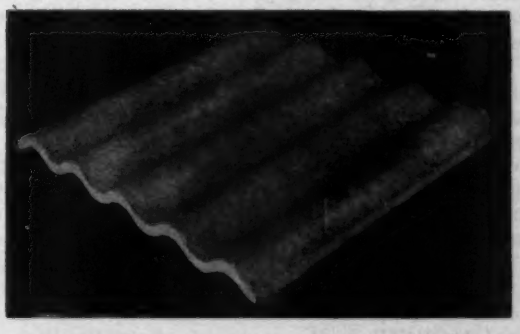
The glass and reflector are set in a cast aluminum case with the glass sealed around the edges to keep moisture off the reflecting surfaces. To protect the lens against vandalism it is covered with an expanded metal shield, galvanized after forming. Experience shows that even if the glass is wilfully broken by shooting at it with firearms, fragments of the glass are almost sure to adhere to the case around the edges so that the signal will function to some degree until the glass can be replaced. The back of the case is reinforced by galvanized steel angles, which also serve to support the danger sign as shown in the illustration. Another important feature of the device is an adjustable bracket by means of which the sign is attached to the steel pipe post on which it stands. The efficiency of the sign is dependent upon its being properly aimed or focused, both vertically and horizontally, and this requirement is amply provided for in the adjustable brackets. Once properly focused, the sign will hold its position indefinitely unless subjected to severe abuse, as from collision with vehicles. The signal is ordinarily installed by setting the two-inch pipe post in a concrete base. Experience with the sign has demonstrated that its efficiency is not materially reduced by ordinary coatings of dust. Snow also is said not to affect the sign more adversely than other warning signals used.

The glass used in highway crossing signs is 12 in. square; smaller sizes are being used in signs for other purposes. One of the more recent developments now in the experimental stage is the application of these reflectors to switch stands to take the place of both the lamp and the target. This warning signal is being handled by Thompson Brothers, 1806 South Michigan avenue, Chicago.

Corrugated Asbestos Wood For Roofing and Siding

JOHNS-MANVILLE, INC., New York, has recently developed a new form of its Corrugated Asbestos Wood, a material which it has manufactured heretofore, but which is now being prepared in a new and improved form. Essentially this product consists of a rigid corrugated slab of asbestos fibre and Portland cement, moulded under hydraulic pressure into a dense, tough composition, which will not rot, rust or burn and which is said to be highly resistant to the action of alkali, gas and acids.

It is designed for use as a durable and fireproof roofing and siding, which is sufficiently strong to permit of its application directly on purlins in skeleton frame construction. As such it is used extensively in the low buildings over boilers where sustained high temperatures or condensation are present and it is particularly adapted for use in engine houses, boiler houses, chemical labora-



A Section of Corrugated Asbestos Board

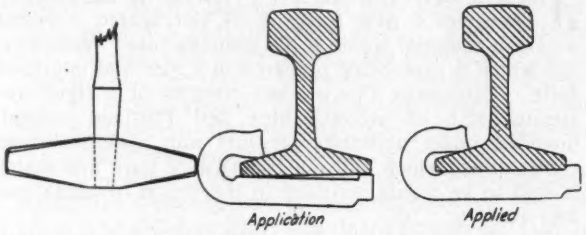
tories, heating plants, train sheds and similar structures, where general utility and durability under severe service are required.

The product is furnished in sheets 8 ft. long, 42 in. wide, and ¼ in. thick, or in any length that can be cut from this size. The sheets are made smooth on one side with the other side pebbled. In building construction the sheets may be laid on pitches as low as 2 in. to the foot, providing the joints are properly puttied, and provide a satisfactory roof without putty on pitches above 4 in., unless extraordinary service conditions are present. The maximum purlin spacing governing the use of these sheets is 45 in. center to center, this spacing accommodating the 8 ft. sheet and allowing laps of 6 in.

The roofing requires no more skill in application than other roofing of the same type and embodies the distinctive feature of having beveled cut corners which permit the sheets to nest tightly at the joints. These cut corners not only avoid unnecessary extra thicknesses of the joint but eliminate wedge shaped openings which permit wind and rain to enter the building. A further advantage of the cut corner is that in application the sheets can be laid in continuous straight lines which have the effect of contributing to the general appearance of the job. The sheets require no painting and aside from their resistance to wear and to fire, they are insured against warping or peeling in service.

A Simple Rail Anchor

THE DRAWING shows the most recent development in rail anchors, being the Fair rail anti-creeper which has recently been placed on the market by the P & M Company, Chicago. It is made of a ⅞ in. by 1⅛ in. bar of high-carbon, heat-treated steel bent to the shape indicated. The application consists of driving the large end on the outside of the rail base until the small offset



The Fair Anchor

takes a bearing on the gage side of the base. It is removed by striking the small end downward and toward the rail.

The anchor is economical in first cost and in cost of application and stands, in test, a resistance of 25,000 lb. against sliding along the rail. Five thousand of these anchors were placed in heavy traffic track last fall and several hundred of these were removed and reapplied soon after their application on account of tie renewals. This test is said to have gone through the winter with almost 100 per cent performance.

A New Explosive—Dumorite

DUMORITE is the result of efforts made by the E. I. du Pont de Nemours Company, Wilmington, Del., to adapt for commercial use the surplus explosive material left in the hands of the United States government following the war. Compared with other explosives, it has about the same strength of 40 per cent ammonia dynamite, but unlike an ammonia or straight dynamite explosive, which contains liquid nitroglycerin, this explosive is solid and dry, by reason of which it is not subject to freezing and does not produce headache in handling.

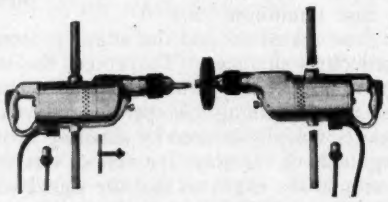
Dumorite will stand water fairly well and in this respect is about equal to an ammonia dynamite, although when used in wet work the manufacturers advise that the priming cartridge or the one containing the detonator be absolutely dry. By reason of the latter feature the explosive is particularly well adapted to moist climates or atmospheres. It is comparatively safe to handle, packs well in the bore hole and can be packed in any size cartridge desired, in bag form if necessary. The Dumorite explosives are somewhat bulky compared with the standard dynamites; a 50-lb. case of Dumorite No. 2, the strongest one of the Dumorite line, running 130 cartridges of 1¼ in. by 8 in., as compared with 100 cartridges of the standard grades.

With these distinguishing features the Dumorite line of explosives are presented by the company to meet every work for which the standard 40 per cent ammonia dynamite is suited, and if the material is not too hard or if too great a shattering is not desired, the company states the explosive will even meet conditions where straight nitroglycerin dynamite is frequently used. Where the explosive is adapted for use, the fact of its greater bulkiness over the standard grade of explosives affords the possibility of effecting a considerable saving in the material. The explosive has been tested out in many kinds of work, in quarries, gypsum mines, salt mines, ore mines, etc., with results which are said to have been satisfactory.

A New Portable Electric Drill

AMONG RECENT developments in mechanical equipment which are of interest to maintenance men is the combination portable drill and grinder shown in the accompanying illustration. This device was developed to meet service involving both hand drilling and grinding operations under conditions where the use of separate machines for each class of work is not warranted. The tool weighs 18 lb., develops one-half horsepower under load and is adapted to drilling in both wood or steel. It has a drilling capacity of ⅛ in. to ⅝ in. in steel and when used as a grinder carries a ¾ in. by 6 in. grinding wheel.

Two separate speeds are provided, the slow speed being used for drilling and the high speed for grinding. The switch is located in the top handle and is of the make-and-break type, which affords control of the tool at all times. The tool is simple in construction and is encased in aluminum castings which contribute materially to its



The Wodack Combination Electric Drill and Grinder

lightness in weight. The motor is of the Universal type, as a result of which it may be operated on either direct or alternating current of the same voltage, and is equipped throughout with ball-bearings. As will be noted in the illustration, the transformation of the tool from a drill into a grinding tool is made simply by inserting the grinding wheel axis into the drill chuck in the place of the drill. The tool is known as the Wodack combination drill and grinder and is a product of the Woodack Electric Tool Corporation, Chicago.

Roadmasters' Association

The executive committee met at the Auditorium hotel, Chicago, on March 14, to plan for the fortieth annual convention, which will be held in the Hotel Statler, Cleveland, in September. The chairmen and members of the standing committees of the association met with the executive committee at lunch, following which the tentative reports of the various committees were discussed. The program of the convention will contain the reports of five committees and two special papers. Special efforts are being made to secure a large attendance at this meeting, which will complete the fourth decade of the society's existence.

Wood Preservers' Association

The executive committee met at the Hotel Sherman, Chicago, in an all-day session on Tuesday, March 14, the special topic for consideration being the appointment of the committees for the ensuing year. In addition to the standing committees, a new committee was created to investigate and report on tropical hard woods as a future tie supply. Encouraging reports were received from the drive for increased membership which was launched at the conclusion of the convention last January, approximately 45 applications for membership having been received to date, or one per day. In the evening approximately 30 members of the association gathered at dinner.

The Bridge and Building Association

Reports received from the committees continue to indicate that they are making rapid progress in the preparation of their reports. It is estimated that the work of all of the committees is already at least 50 per cent completed and indications point to their completion in ample time for publication and distribution prior to the convention. Two eight-page bulletins to the members have already been issued this year and a third will be in the mail by April 10. The members of the committees and other members of the association living in the vicinity of Chicago held a get-together dinner in that city on March 4, at which approximately 60 were present.

Maintenance of Way Club of Chicago

The next meeting of the Maintenance of Way Club of Chicago will be held at the Auditorium Hotel on the evening of April 19, when P. F. McManus, general superintendent of the Elgin, Joliet & Eastern, will give a talk on the utilization of work train service by the maintenance of way forces. A get-together dinner will be given at the hotel at 6:15 p. m. for all who wish it.

COST OF THE LABOR BOARD.—The expenditures of the United States Railroad Labor Board averaged approximately $30,000 a month. When created on April 16, 1920, an appropriation of $50,000 was provided to cover all extra expenditures up to June 30 of that year, which sum was entirely expended during that period. An appropriation of $450,000, then made for the fiscal year of 1921, was entirely consumed at the close of the year with the exception of approximately $33,000.

The Material Market

PRESENT indications point to at least a temporary upward trend of the iron and steel market. Structural shapes, plates and bars are now at a distinctly higher level than they were two or three weeks ago. Unfortunately, this fact is not brought out fully in the table given below, because the bottom of the sag occurred between the dates of the two sets of quotations here reported. Structural material was definitely quoted at 1.35 cents Pittsburgh and 1.40 cents Chicago during the intervening time, but it is now on a generally upward grade. This tendency to increase prices is not yet apparent in the case of track materials. Further reductions are noted in spikes, bolts and tie plates, and it is generally understood that large orders have been placed at figures considerably below those given. This is true particularly in the case of tie plates, which are now at a very low figure. That the railroads are taking advantage of this present favorable condition of the market is evident from recent large orders for these materials.

	Prices in Cents Per Pound			
	Pittsburgh	Chicago	Pittsburgh	Chicago
	February 20		March 20	
Track spikes	$2.15 to $2.20	$.... $2.48	$2.00 to $2.10	$3.38 $2.48
Track bolts	3.00 to 3.25	3.38 to 3.48	2.90 to 3.00	3.43 to 3.48
Angle bars	.... 2.40	.... 2.40	.... 2.40	.... 2.40
Tie plates, steel	.... 2.00	.... 1.75	1.65 to 1.90	1.65 to 1.75
Tie plates, iron	....	.... 1.75	....	1.65 to 1.75
Plain wire	2.15 to 2.25	2.53 to 2.63	.... 2.25	.... 2.63
Wire nails	.... 2.40 to 2.50	2.78 to 2.88	.... 2.40	.... 2.78
Barbed wire, gal.	3.00 to 3.15	3.38 to 3.53	.... 3.05	.... 3.43
C. I. pipe, 6 in, or larger, per ton	....	.... 42.60	....	.... 42.10
Plates	1.40 to 1.50	1.55 to 1.60	1.45 to 1.50	.... 1.60
Shapes	1.40 to 1.50	1.55 to 1.60	1.45 to 1.50	.... 1.60
Bars	1.40 to 1.50	1.55 to 1.60	1.45 to 1.50	.... 1.60

The general improvement in the tone of iron and steel industry is reflected in the price of scrap. The table below shows advances in all the quotations with the exception of relaying rail:

	Prices Per Gross Ton at Chicago	
	February	March
Relaying rails	$20.00 to $25.00	$20.00 to $25.00
Rerolling rails	12.00 to 12.50	13.75 to 14.00
Rails less than 3 ft. long	12.50 to 13.00	13.75 to 14.00
Frogs and switches cut apart	11.25 to 11.75	12.50 to 12.75
	Per Net Ton	
No. 1 railroad wrought	10.50 to 11.00	11.75 to 12.00
Steel angle bars	10.50 to 11.00	12.25 to 12.50

No marked changes are noted in the prices of lumber in the south or on the west coast. Wholesale lumber sales in the two major markets, namely, Southern yellow pine and Douglas fir, have continued with but minor variations for a number of months. One factor of note in this connection which applies to both markets is the fact that since the first of the year the total cut has exceeded the total sales by 10 per cent in the case of Southern pine and nearly 15 per cent in the case of Douglas fir. This would indicate that there should be little difficulty with deliveries in the near future.

Southern Mill Prices		
	February	March
Flooring, 1x4, B. and B. flat	$45.15	$41.60
Boards, 1x8, 14 and 16, No. 1	29.90	29.00
Dimension, 2x4, 16, No. 1	21.75	22.25
Dimension, 2x10, 16, No. 1, common	18.65	21.60
Timbers, 4x4 to 8x8, No. 1	18.75	19.40
Timbers, 3x12 to 12x12, No. 1	21.85	23.70
Douglas Fir Mill Prices		
Flooring, 1x4, No. 2, clear, flat	29.00	27.28
Boards, 1x6, 6 to 20, No. 1, common	11.00	12.00
Dimension, 2x4, 16, No. 1, common	12.50	13.50
Dimension, 2x10, 16, No. 1, common	12.50	13.50
Timbers, 6x6 to 8x8, No. 1, common	15.00	14.00
Timbers, 10x10 to 12x12, rough	15.00	14.00

The prices of Portland cement show but minor fluctuations. Current quotations indicate slight adjustments upward from those given a month ago. Prices of cement per barrel in carload lots, not including package, are as follows:

Pittsburgh	$2.02	Milwaukee	$2.18
Detroit	2.17	Minneapolis	2.24
Chicago	1.97	Davenport	2.16
Duluth	1.95	Cincinnati	2.35

General News

During 1921, 93 miles of new railway was constructed in the province of Alberta, Canada, bringing the total mileage up to 4,789 as compared with 1,782 in 1910 and 1,060 in 1905.

The Canadian Pacific has instituted a plan of offering scholarships in the Toronto University and in the McGill University to apprentices and other employees of the company who are under 21 years of age and to minor children of employees who are chosen by competitive examination.

The Chicago, Rock Island & Pacific is making inquiries regarding the radiophone with a view to determining the practicability of its installation on its Rocky Mountain Limited and Golden State Limited trains to provide its patrons with news bulletins and with musical concerts during the evening.

Five carloads of rose bushes, a single shipment, were recently moved by freight across the continent from Los Angeles, Cal., to Riverton, N. J., 3,323 miles, in 12 days, or at the rate of about 276 miles per day. The movement was over the Southern Pacific, the Southern and the Pennsylvania. The shipment weighed 129,360 lb.

Calcium chloride in concrete for curing purposes has demonstrated its value in actual practice and laboratory experiment to the extent that the Division of Highways of Illinois has adopted it both for accelerating the setting of concrete in cold weather and as a simpler and more practical method of curing than that of damp earth.

By way of observing its seventieth anniversary, the Chicago, Rock Island & Pacific will distribute a historical booklet of the interesting facts regarding the development of the road. The first passenger train operated by the Rock Island was run from Chicago to Joliet on October 10, 1852, the year the first train reached Chicago from the east.

The Buffalo, Rochester & Pittsburgh, in line with other roads that have been mentioned in these columns, has enlisted the employees in an effort to improve conditions on its lines by establishing suggestion bureaus in all departments to receive and consider suggestions of economy made by employees. The circular calling attention of the employees to this plan says in part: "As it must be a matter of some satisfaction for an employee to realize that he is not only a potent factor in economic production, but personally responsible for creating employment for his fellowmen, the company will make suitable cash awards for every suggestion which has an economic value and in addition to such award will use the entire amount saved by such suggestion to hire additional employees. All suggestions received in this manner are to be handled by a departmental stecretary who will submit the suggestions to the bureau for consideration."

The Interstate Commerce Commission has been petitioned during the past month for authority to abandon 14 miles of line on the Escanaba & Lake Superior from Northland to Camp Ten, Mich.; 10 miles on the Zwolle & Eastern in Sabine Parish, La.; a total of 57 miles on the Columbus & Greenville, extending from Stoneville to Percy, Miss., and from Itta Bene to Webb, Miss.; a total of 58 miles on the Northern Pacific extending between Coda and Washburn, Wis., and from Iron River to Washburn, and four miles on the Lehigh Valley extending between Ganoga Lake to Ricketts, Pa.; 20 miles on the Ashland, Odanah & Marengo, running from Odanah, Wis., to lumber tracks on which the lumber has been cut and a branch line on the Atlanta & St. Andrews Bay between Panama City and St. Andrews Bay, Fla., previously abandoned for an experimental period.

There was recently hauled from Greenville (Jersey City) to Sacramento, Cal., a distance of 3,080 miles, a special 100-car shipment of automobiles, which was kept intact from the point of origin until its arrival at Ogden, Utah, a distance of 2,387 miles. When passing around the Horseshoe Curve on the Pennsylvania, about eight miles west of Altoona, Pa., this train was hauled by four locomotives, two in the front and two at the rear.

The number of persons employed by the Interstate Commerce Commission at the close of the year 1921 is reported as 1,680, of which 1,416 were located in the District of Columbia and 264 in the field. As compared with the number employed in January of the same year, this figure is less by 512. At that time 975 of the total of 2,191 employees in service were in the District of Columbia and 1,217 in the field. The reason for the greater number of employees being situated in the District of Columbia at the close of the past year being attributed to the transfer of much of the valuation work to Washington.

All main line icing stations on the Southern Pacific, Union Pacific route, of the Pacific Fruit Express are now equipped with island or double car icing platforms accommodating 55 cars on each side, the claim being made that this type of construction affords a decided saving in the handling of ice as well as in the time required in performing the work and dispatching trains. The platforms are frame structures approximately 14 ft. high with shelter roofs and with working areas 14 ft. wide on which the ice is handled. Along the center of the platforms for the entire length are installed mechanically-operated endless chain conveyors. This plan permits the railroad to handle trainloads of refrigerator cars direct to the icing platform with a road engine, after which the incoming engine and caboose are cut off and the outgoing engine coupled on.

Reports from various sections of the country show that heavy damages were encountered by railroads throughout the west, northwest and central west by snowstorms and floods, which occurred during the latter part of February and the first week in March. As a result of the storm which passed over the north-central states on February 21, train service in northeastern Wisconsin and northern Michigan was at a standstill for 2½ days, with both passenger and freight trains on the Chicago, Milwaukee & St. Paul, the Minneapolis, St. Paul & Sault Ste. Marie, the Chicago & North Western and other roads stalled and service completely demoralized. On the Great Northern a rotary snowplow collided with a passenger train drawn by two engines near Montrose, Minn., about 40 miles west of Minneapolis, with the resultant death of five trainmen and the injury of 11 passengers. Traffic over most of the roads excepting northeastern Wisconsin was not fully resumed until after February 27. During the first week in March, traffic was generally delayed on the Pacific coast and points east by deep snow and drifts, the Western Pacific trains between Salt Lake and San Francisco having been delayed by as much as 18 hours in instances, with the Chicago, Rock Island & Pacific trains running 12 hours late into Kansas City and more or less damage being suffered generally throughout Kansas, Missouri, Oklahoma, north Arkansas and Texas.

Personal Mention

General

G. S. Giles has been appointed fire protection engineer of the Union Pacific, with headquarters at Omaha, Neb.

George Bradshaw, supervisor of safety of the Pere Marquette, with headquarters at Detroit, Mich., has resigned to retire from business.

William D. Pence, for eight years a member of the Engineering Board, Bureau of Valuation, Interstate Commerce Commission, and for seven years prior to that time with the Wisconsin Railroad and Tax Commissions, has resumed a consulting engineering practice, having established an office at 608 South Dearborn street, Chicago.

Louis H. Long, vice-president of the Southern Pacific of Mexico, with headquarters at Tucson, Ariz., and of the Arizona Eastern, with the same headquarters, with supervision over both the operating and engineering departments, retired from railroad service on March 1. Mr. Long was born in Solano county, Cal., and studied at the University of California. He entered railway service on September 20, 1885, as an employee in the engineering department of the Southern Pacific, where he was engaged chiefly in location work. Since that time he has been assistant engineer on location and construction; an engineer in charge of construction; since February 1, 1909, chief engineer of the Southern Pacific of Mexico; and since July 15, 1913, vice-president of that road and the Arizona Eastern, which positions he has held up to his recent retirement.

Engineering

C. K. Bowen has been appointed chief engineer of the Southern Pacific of Mexico, with headquarters at Empalme, Sonora, Mexico, succeeding **L. H. Long,** retired.

J. C. McClure, assistant to the president of the Arizona Eastern, with headquarters at Tucson, Ariz., has been appointed chief engineer, succeeding **L. H. Long,** retired. Mr. McClure will combine the work of the new office with his other work as assistant to the president.

G. H. Nickerson, superintendent of construction in the county engineer's office, Merced County, Cal., has been appointed chief engineer of the Yosemite Valley, with headquarters at Merced.

W. R. Triem has been promoted to assistant division engineer of the Logansport division of the Northwestern region of the Pennsylvania, with headquarters at Logansport, Ind., succeeding **F. M. Hawthorne,** promoted.,

T. C. Herbert, division engineer of the St. Louis division of the Pennsylvania, with headquarters at Terre Haute, Ind., has been promoted to superintendent of the Peoria division, with headquarters at Decatur, Ill.

T. J. Irving, assistant engineer on the Iowa division of the Chicago & North Western, with headquarters at Boone, Iowa, has been appointed division engineer at Winona, Minn., to succeed **W. J. Jackson,** deceased, and **C. H. Wells,** an assistant in the engineering auditing department, Chicago, has been appointed assistant engineer at Boone, to succeed Mr. Irving.

F. M. Hawthorne, whose promotion to division engineer of the St. Louis division of the Southwestern region of the Pennsylvania, with headquarters at Terre Haute, Ind., was noted in last month's issue, was born at Wingate, Ind., on October 8, 1883, and completed an engineering course at Purdue University in 1905. He entered railway service with the Pennsylvania at Columbus, Ohio, and from 1909 until 1917 served as engineer in charge of construction. In the latter year he was promoted to assistant division engineer, in which capacity he served at Louisville, Ky., Terre Haute, Ind., Pittsburgh, Pa., and New Castle, Pa., until March 1, 1920, when he was promoted to division engineer of the Logansport division, with headquarters at Logansport, Ind. In March, 1921, Mr. Hawthorne was appointed assistant division engineer at Logansport, the position he held at the time of his recent promotion.

John A. McGrew, superintendent of maintenance of the Delaware & Hudson, has been appointed general superintendent of equipment and way and his former position abolished. Mr. McGrew will continue in charge of all maintenance work, both of equipment and way. Mr. McGrew was born June 8, 1873, at Bridgewater, Ohio, and was graduated in civil engineering from Ohio State University in 1895. Upon his graduation he became assistant superintendent of construction of the Columbus & Westernville Electric and, in 1896, entered the service of the Pennsylvania, in its engineering department, at Wellsville, Ohio. From 1899 to 1901 he was assistant engineer maintenance of way, at Logansport, Ind., and from 1901 to 1903 was engineer maintenance of way, at the same point. He was then transferred to Pittsburgh in the same capacity. For six months in 1904 he was special agent for the general manager of the Chicago, Rock Island & Pacific, and from that time until 1909 was consecutively a consulting engineer and contractor at Columbus, Ohio, and president of the National Engineering Company. In September, 1909, he entered the service of the Delaware & Hudson as inspector of maintenance of its lines, allied properties and street railways, and in 1910 was appointed superintendent of the Saratoga and Champlain divisions, with headquarters at Albany, N. Y. From July, 1917, to February 21, 1919, Mr. McGrew was in military service, first as a consulting quartermaster in the construction division and then as a major in the railway division of the American Expeditionary Forces. In April, 1920, he returned to the Delaware & Hudson as superintendent and was appointed superintendent of maintenance on April 1, 1921, which position he held until February 24, 1922, when his promotion became effective.

Track

J. Fredrickson, roadmaster on the Northern division of the Great Northern, with headquarters at Moorhead, Minn., has been transferred to the Willmar-Sioux City division, with headquarters at Sioux Falls, S. D., succeeding **T. R. Patterson,** assigned to other duties.

P. H. Burke, roadmaster on the Chicago, Burlington & Quincy, with headquarters at Aurora, Ill., for some time in the future will devote a greater portion of his time to the track elevation work at Aurora, and F. L. Tobin, roadmaster at Herrin, Ill., has been transferred to Aurora as assistant roadmaster, to relieve Mr. Burke.

George J. Daly, general foreman of track on the Erie, with headquarters at Warren, Ohio, has been promoted to supervisor of the Meadville division, with headquarters at Meadville, Pa. Mr. Daly was born at Castlebar, Ireland, on September 24, 1876, and entered railway service with the Erie as a trackman on October 1, 1892, later being promoted to blockman. From April 1, 1897, to April 16, 1917, Mr. Daly served as track foreman at Rutherford, N. J., and on the latter date was promoted to supervisor, in which capacity he served on various divisions until June 1, 1921, when he was appointed extra gang foreman on the Meadville division. On December 1, 1921, he was promoted to general foreman, the position he held at the time of his recent promotion.

F. L. Solander, supervisor on the Northwestern region of the Pennsylvania, with headquarters at Sandusky, Ohio, has been transferred to Marion, Ohio, succeeding **A. Benson,** retired. **W. F. Renz** has been appointed supervisor at Sandusky, in place of Mr. Solander. Mr. Renz was born at Greenville, Ohio, on March 22, 1887, and was educated at Wayne Technical Academy. He entered railway service with the Norfolk & Western in 1906 as a rodman and was later promoted to transitman. From 1908 to September 11, 1909, he served as assistant city engineer of Greenville, Ohio, and on the latter date entered the employ of the Grand Rapids & Indiana (now the Grand Rapids division of the Pennsylvania) as an assistant on an engineering corps, later being promoted to assistant division engineer, the position he held at the time of his recent appointment.

Bridge

G. W. Rear, general bridge inspector, Southern Pacific, Pacific System, with headquarters at San Francisco, Cal., has been promoted to engineer of bridges, with office at the same place.

Purchases and Stores

C. C. Kyle, acting general storekeeper of the Northern Pacific, with headquarters at St. Paul, Minn., has been promoted to general storekeeper with the same headquarters, succeeding **O. C. Wakefield,** deceased.

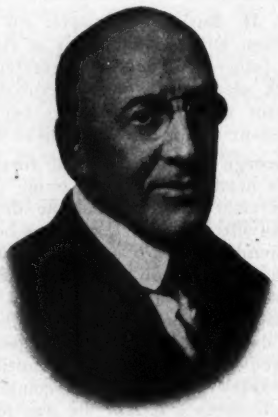
Edwin H. Gaines, Jr., whose appointment as purchasing agent of the Tennessee Central, with headquarters at Nashville, Tenn., was announced in the March issue, was born at Nashville on November 8, 1887, and entered railway service in September, 1905, as a file clerk in the passenger traffic department of the Nashville, Chattanooga & St. Louis at Nashville, following which he was successively chief file clerk, secretary to the chief clerk and advertising agent in the above-named department of that road until February 1, 1909, and from July, 1913, invoice clerk in the receivers' office, secretary to the receivers, secretary and chief clerk to the general superintendent, and chief clerk to the receivers until his recent promotion.

Obituary

John Fogelberg, pioneer railroad contractor of the Northwest, died March 4 at Minneapolis, Minn., at the age of 77. Mr. Fogelberg had the distinction of being the first man to do contract work for James J. Hill.

Robert B. Stanton, formerly a division engineer on the Union Pacific, died at a hospital at Stamford, Conn., on February 23. Mr. Stanton was 76 years of age, and was known for his engineering aid in the construction of the "Georgetown loop" and the surveying of a railroad line through the Grand Canyon.

John R. Savage, general superintendent of the Long Island, who died at New York on February 25, was an engineer by education and experience. Mr. Savage was born on April 17, 1869, at Philadelphia and was graduated from the University of Pennsylvania in 1889, following which he entered the service of the Pennsylvania Railroad as a rodman and leveler. He left this position the following year to go with the government engineering corps. In May, 1895, he was appointed engineer of the Seattle & Lake Washington Company. Two years later he returned to the Pennsylvania as an assistant engineer. For several months in 1900 he was employed on surveys for a proposed railway from Cornwall to Highspire, Pa. In 1901 he entered the service of a steel company, which position he held until 1904 when he became chief engineer of the Long Island. In 1917 he was appointed general manager. In 1920, when the organization of the property was modified, he was appointed general superintendent, which position he was holding at the time of his death.



J. R. Savage

W. J. Jackson, division engineer of the Minnesota division of the Chicago & North Western, with headquarters at Winona, Minn., died March 13, as a result of an attack of pneumonia the week previous. Mr. Jackson was born in Chicago on January 7, 1873, and received his education at the University of Illinois. He entered railway service with the Chicago & North Western as a tapeman on April 1, 1899, and served as rodman, instrumentman and assistant engineer until his appointment as acting division engineer of the Minnesota and Dakota division on May 15, 1909, later being transferred to the Ashland division. On May 12, 1913, Mr. Jackson was promoted to division engineer of the Minnesota and Dakota division, the position he held at the time of his death.

C. H. Niemeyer, acting engineer maintenance of way on the Pennsylvania, with headquarters at Williamsport, Pa., died at Philadelphia on March 4. Mr. Niemeyer was born in 1869 and completed an engineering course at Cornell University in 1891, following which he entered the service of the Pennsylvania as a rodman. He was promoted to assistant supervisor in 1893 and to supervisor in 1900. In 1905 he was made division engineer, which position he held until September, 1916, when he was promoted to assistant chief engineer maintenance of way at Philadelphia. About a year ago he was transferred to Williamsport, Pa., as acting engineer maintenance of way, the position he held at the time of his death.

F. J. Angier, superintendent of timber preservation of the Baltimore & Ohio, with headquarters at Baltimore, Md., died on the morning of March 24 at Mercy Hospital, Baltimore, from the effects of an operation for appendicitis. Mr. Angier was born December 22, 1866, at Beardstown, Ill., and entered railway service at the age of 16 as a round house helper on the Chicago, Burlington & Quincy at Aurora, Ill. In January, 1883, he was made a clerk in the mechanical and supply department at Beardstown, Ill., and he was appointed a clerk in the mechanical department at Ottumwa, Iowa, in December, 1893. In July, 1897, he entered the laboratory at Aurora, Ill., as a clerk and later as a chemist, where he remained until September, 1898, when he was promoted to superintendent of the tie plant at Edgemont, S. D. This position he held at Edgemont and later at Sheridan, Wyo., when the plant was moved to the latter point, until 1908, when he was promoted to superintendent timber preservation, with headquarters at Galesburg, Ill. He left the service of the Chicago, Burlington & Quincy on May 1, 1910, to enter the employ of the Kettle River Company at St. Louis, where he remained until 1911, when he became superintendent tie preservation on the Baltimore & Ohio, the duties of which position, together with additional duties of inspecting all ties purchased by that road, Mr. Angier assumed until his death. Mr. Angier was secretary of the American Wood-Preservers' Association for 13 years, during which he was one of the most prominent factors in building up this organization. He was elected president of this organization at its convention in Chicago last January.

F. J. Angier

Joseph Wood, director of the Pennsylvania Railroad, who died at his home in Pittsburgh, Pa., on March 4, was a graduate civil engineer and received his early training in railway service as a member of the engineering department of the Pennsylvania. Mr. Wood completed an engineering course of study at the Pennsylvania Polytechnic College, immediately following which he entered the service of the Pennsylvania as a rodman. Later he became superintendent of motive power at Fort Wayne, Ind., and subsequently general superintendent of transportation of the Pennsylvania, Lines West, general manager of the Pennsylvania, Lines West; finally holding the positions of first vice-president of the Pennsylvania, Lines West, and president of the Vandalia Railway and the Grand Rapids & Indiana.

Construction News

The Alberta & Great Waterways contemplates the construction of a boat landing at Waterway, Alta.

The Atchison, Topeka & Santa Fe has been authorized by the Kansas State Charter Board to construct a 43-mile cutoff extending from Eldorado, Kan., to Ellinor; also a four-mile belt line just east of Eldorado, the latter to be known as the Eldorado & Santa Fe.

The Atchison, Topeka & Santa Fe, noted in the March issue as contemplating the construction of an extension to its lines from Owen, Okla., to Pawhuska, a distance of approximately 40 miles, has awarded a contract for this work to Maney Bros., Oklahoma City, Okla.

This road closed bids March 20 for the construction of two one-story brick lavatory buildings in Chicago, the one 24 ft. by 132 ft. and the other 216 ft. by 42 ft.

This company contemplates undertaking numerous improvements and betterments to its lines during the current year, among which are the construction of a new division office building, Harvey hotel and railway reading room at Newton, Kan., a new brick outbound freight house at Dallas, Tex., and extensive additions and improvements to the Harvey house at Gallup, N. M. The aggregated total set aside in the 1922 budget for stations and office buildings is $1,047,919. New power plants will be constructed at San Bernardino, Cal., and Albuquerque, N. M., and hot-water boiler-washout systems will be installed at Cleburne, Tex., and Temple. The funds appropriated for shop buildings, engine houses, etc., amount to $960,170, and for shop machinery and tools, $735,901. Bridge renewals are estimated at $1,519,203. Automatic signals estimated to cost approximately $600,000 will be installed, $567,443 will be spent on the elimination of grade crossings and $219,828 on water stations.

This company, noted in the February issue as having closed bids for the construction of extensions and improvements to its machine shops at San Bernardino, Cal., has awarded the contract for this work to C. A. Fellows, Los Angeles, Cal. This same company has awarded a contract to the Hayes-Oser Company, San Francisco, for the construction of a reinforced concrete icing plant at Riverbank, Cal., 84 ft. by 134 ft. The plant will have a daily capacity of 150 tons, with 10,000 tons storage space.

This company, noted in the March issue as contemplating the construction of 75 miles of second track between Yampai, Ariz., and Griffith, including the reduction of a grade, has awarded the contract for this work to the Sharp-Fellows Contracting Company, Los Angeles, Cal. A new refrigerating plant estimated to cost approximately $40,000, for use in its El Tavor Hotel, Grand Canyon, Ariz., is also contemplated.

The Bastrop & Lake Providence has been organized to construct a railroad from a point near Bastrop, La., eastward to the town of Mer Rouge, and from there to Point Pleasant, a distance of about 10 miles. Eventually the road will be extended to Lake Providence, an additional 25 miles.

The Boston & Albany will in the near future build a temporary passenger subway at Springfield, Mass., to cost approximately $25,000. New bridges will be built at Webster, Mass., to cost approximately $25,000, and at West Brookfield, to cost approximately $50,000. Fender work to be done on the Chelsea creek drawbridge will cost in the neighborhood of $15,000.

The Canadian National will extend its Vancouver, B. C., line for a distance of about 10 miles, the grading for which has already been completed. It is expected that the work will be undertaken by company forces as soon as weather conditions are favorable. The same company will also construct a line 3.5 miles in length connecting the Grand Trunk Pacific's Riverhurst, Sask., subdivision, and the Canadian National's, Craik, Sask., subdivision. The Saskatchewan Legislature Assembly recently adopted a resolution authorizing petitions to the Dominion Government asking immediate appropriations of money for the completion of the Canadian National branch lines projected into that province, and for the continuance of the construction of such lines until finished. Figures show that 342 miles of branch lines in this province have been graded, but only 231 miles of track laid.

The Canadian Pacific is accepting bids for the construction of a freight terminal building at Windsor, Ont., to include a one-story office building, 40 ft. by 60 ft., and a 40 ft. by 300 ft. shed.

This company is accepting bids for the construction of a new bridge across the Coquitham river to replace a structure which was washed away during the heavy floods of last November. The structure will be 300 ft. in length, of steel construction, with concrete piers.

This company will construct coaling plants at Swift Current, Sask., and Medicine Hat, Alta., of 280 tons capacity, and like plants at La Riviere, Man., and Eagle River, Ont., of 100 tons capacity. An old trestle chute at Estevan, Sask., will be replaced by a more modern plant. The same company will also install automatic signals at Sidney, Man., and Ruler Creek, B. C.

The Chattanooga-Crossville is to be constructed from Chattanooga, Tenn., to Crossville, a distance of about 35 miles, at which latter point a connection will be made with the Tennessee Central. It is expected that this road will traverse the largest undeveloped coal fields in that state. C. E. James of Chattanooga is in charge of the project, for which surveys are now being made.

The Chesapeake & Ohio closed bids March 22 for the construction of a 500-ton reinforced concrete coaling station at Peach Creek, W. Va., and one at Churmond.

The Chicago & Alton, in conjunction with residents of Greene and Jersey counties, Illinois, will construct an extension to its lines from Titus, Ill., to Reddish Road, a distance of about 4 miles, and a further extension from a point approximately half-way on this line to Hardin, Ill., a distance of about 2 miles. Farmers in this vicinity will furnish the right-of-way and ties, and do the grading. The Illinois Commerce Commission has authorized the extension and a petition for permission to do this work is now on file with the Interstate Commerce Commission.

The Chicago & Eastern Illinois and the **Pittsburgh, Cincinnati & St. Louis** have been petitioned by Arthur, Ill., through the Illinois Commerce Commission, to construct a suitable station at that point.

The Chicago & Western Indiana has awarded a contract to Rowley Bros., Chicago, for the remodeling of its passenger station at Sixty-third and Wallace streets, Chicago.

The Chicago, Burlington & Quincy has awarded a contract to John Griffiths & Son, Chicago, for the repairing of its 15-story general office building in that city, which was badly damaged by fire on March 15.

This company has also awarded a contract to John Griffiths & Son for the construction of a four-story reinforced concrete and steel inbound freight house, 300 ft. by 700 ft., at Chicago. The same company contemplates the construction of a brick passenger station at Westmont (near Hinsdale), Ill., and one at Franklin, Neb., and contemplates the construction of a new electric power house at Aurora, Ill., estimated to cost $100,000.

The Chicago Great Western, noted in the February issue as receiving bids for the construction of a steel coaling station at Chicago estimated to cost about $23,000, has awarded the contract for this work to the Roberts & Schaefer Company, Chicago.

This company, noted in the March issue as accepting bids for the construction of a two-story frame office building at St. Paul, Minn., has awarded the contract for this work to John Jacobson, Marshalltown, Iowa.

The Chicago, Ottawa & Peoria has been petitioned by the city of Ottawa, Ill., through the Illinois Commerce Commission, to rebuild its bridge across the Fox river at Main street in that city.

The Chicago, Rock Island & Pacific has been petitioned by the city of Trenton, Mo., through the Missouri Public

Service Commission, to construct a viaduct over its tracks at 12th or 13th streets, in that city. This company has awarded a contract to the Railway Water & Coal Handling Company, Chicago, for several extensions to its fire protection pipe lines at its tie plant at Little Rock, Ark.

The Cleveland, Cincinnati, Chicago & St. Louis has applied to the Interstate Commerce Commission for authority to construct a 3.5 mile cut-off in Delaware County, Ohio. This company, in conjunction with the Peoria & Eastern, and the Lake Erie & Western, have been petitioned by the city of Bloomington, Ill., through the Illinois Commerce Commission, to separate their grade at South Main street in that city.

The Denver & Rio Grande Western contemplates the construction of a subway under its tracks near Overland Park, a suburb of Denver, Colo. No definite plans have as yet been made for this project.

The Dodge City & Cimarron Valley has obtained authority from the Interstate Commerce Commission to construct an extension from a connection with the existing line near Satanta, Kan., in a generally northwesterly and westerly direction through Haskell, Grant and Stanton counties, 55 miles. The line is to be leased to and operated by the Atchison, Topeka & Santa Fe.

The Esquimalt & Nanaimo, in conjunction with the city of Victoria, B. C., is constructing a general traffic bridge over the harbor at Johnson street, in that city. A contract for the construction of the bascule span was awarded to the Canadian Bridge Company, Walkerville, Ont.

The Great Northern contemplates the construction of a one-story car repair shop, 40 ft. by 300 ft., at Minot. N. D., estimated to cost $85,000, and will soon accept bids for the construction of terminal facilities at Wenatchee, Wash., to include a 24-stall roundhouse, storehouse, coaling station, water supply facilities, a boiler washing plant and other facilities. As much material and equipment as possible will be reclaimed from the terminal recently abandoned at Bowdoin, Mont. This company, noted in the March issue as contemplating the construction of a second track between Williston, N. D., and Spring Brook, a distance of about 8 miles, has awarded a contract for the work to A. Guthrie & Co., St. Paul, Minn., and for the bridge and culverts to W. F. Hill, Superior, Wis. This company closed bids March 15 for the construction of a 30-stall roundhouse, shops, storehouses and other terminal facilities at Minneapolis Junction, Minn., and is receiving bids for the construction of a 500-ton reinforced concrete coaling station at Minneapolis, Minn.

The Gulf & Ship Island is constructing a new engine house, 105 ft. by 220 ft., and a new machine shop of steel frame and brick construction, 75 ft. by 200 ft., to replace property destroyed by fire on February 25, of which a loss was estimated at $75,000.

The Gulf Ports Terminal will complete the construction of an extension to its line from Muskogee, Fla., to Mobile, Ala., a distance of 18 miles, giving the railroad a complete line from Pensacola, Fla., through to Mobile. The sum of $300,000 from the $500,000 recently raised by a bond issue will be spent for this work, other construction and additional equipment.

The Illinois Central has been requested by the city of Arcola, Miss., through a petition to the Mississippi Railroad Commission, to construct a new station at that point.

This company, noted in the March issue as accepting bids for the construction of a third track from Tucker, Ill., to Kankakee, a distance of approximately 5 miles, has awarded a contract for the work to M. L. Windham, Centralia, Ill.

This company, noted in the March issue as planning the installation of six miles of 10 and 12-inch pipe lines extending from the city water main in Centralia, Ill., to the company's yards, estimated to cost $75,000, has awarded a contract for this work to Joseph E. Nelson & Sons, Chicago.

The Kansas, Oklahoma & Gulf has petitioned the Kansas Public Utilities Commission for authority to construct an extension to its lines from Baxter Springs, Kan., to Military, a distance of about 6.5 miles, where it is intended to make a connection with the Missouri, Kansas & Texas.

The Leavenworth & Topeka contemplates the construction of a new bridge across the Delaware river at Osawkie, Kan., and to this end has applied to the Interstate Commerce Commission for a loan to finance, in part, this work.

The Los Angeles & Salt Lake has petitioned the railroad commission of California for permission to construct a railroad from Fullerton, Cal., to Anaheim, in Orange county. This proposed road is an extension which was commenced in 1916, and discontinued under federal control.

The Louisiana Railway & Navigation Company, which was noted in the March issue as having petitioned the commission council of New Orleans, La., for permission to construct a passenger station at South Rampart and Girod streets in that city, estimated to cost $125,000, has received a franchise for this work. It is expected that bids will be accepted at once.

The Michigan Central closed bids March 21 for the construction of a brick passenger station at Hastings, Mich. This building will be 33 ft. by 94 ft., and will cost about $25,000.

The Midland Valley has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 100-ton frame coaling station at Panama, Okla., and a similar one at Lefeber.

The Mingo Valley has been authorized by the Interstate Commerce Commission to construct the first 3½ miles of a line from a point on the Monongahela river near the mouth of Mingo Creek, Pa., to a connection with the Montour railroad, 18.2 miles.

The Minneapolis, St. Paul & Sault Ste. Marie, in conjunction with the Chicago & North Western and the City of Ironwood, Mich., noted in the March issue as receiving bids for the construction of a reinforced concrete viaduct 1,500 ft. in length over 23 tracks at Mansfield street, Ironwood, has awarded a contract for this work to the Elbringson Construction Company, Minneapolis, Minn. The work will cost $92,700 and will be commenced at once.

The Missouri Pacific has awarded a contract to Jerome Moss, Chicago, for the construction of a frame and stucco combination freight and passenger station, 23 ft. by 74 ft., at Jerome, Ark.

This company, noted in the February issue as preparing to construct a brick and stucco passenger station, with a Spanish tile roof, and a 500-ft. platform, at Highland Park (Dallas), Tex., estimated to cost $17,000, has awarded the contract for this work to Hickey & Montgomery, Dallas. This company, noted in the March issue as receiving bids for the construction of a one-story station building at Winnsboro, La., estimated to cost $10,000, has awarded the contract for this work to T. S. Leake & Co., Chicago.

The Mobile & Ohio and the **St. Louis-San Francisco** have been asked by the Mississippi Railroad Commission to construct sheds over the platforms of their union passenger station at Tupelo, Miss.

The Montreal Warehousing Company, which operates grain elevators for the Grand Trunk at Montreal, will shortly ask for bids for the construction of an addition to its storage elevators to take care of 1,000,000 bushels of grain; also for a car dumping plant and an additional conveyor for loading grain into ocean vessels.

The Nashville, Chattanooga & St. Louis, in conjunction with the St. Louis-San Francisco, the Southern, the Union, the Louisville & Nashville, and the city of Memphis, Tenn., will construct a reinforced concrete subway under the tracks crossing South Bellevue boulevard in that city. This work is estimated to cost $300,000, of which 80 per cent will be paid by the railroads and 20 per cent by the city. Plans are now being made and work is expected to be started by summer.

The New York, New Haven & Hartford has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of an 800-ton capacity reinforced concrete and steel coaling plant at Providence, R. I.

The North Shore Connecting Railroad has applied to the Illinois Commerce Commission for authority to construct an electric railway system to extend through Evanston, Ill., and the village of Wilmette.

The Northern Pacific contemplates the construction of a three-story combination brick passenger station and office building at Glendive, Mont., estimated to cost $150,000.

The Oklahoma-Southwestern contemplates the construction of extensions to its lines which will total approximately 33 miles.

The Osage has obtained authority from the Interstate Commerce Commission to construct a line from Foraker, Okla., into the Osage County oil fields, a distance of 10.44 miles.

The Pennsylvania has under way the demolition of the umbrella train-shed, which covers all tracks at its Exchange Place Terminal, Jersey City, in place of which platform shelters will be erected. The total cost of the work, for which the Triest Contracting Corporation, New York, has the contract, will be about $300,000. The company has also awarded a contract to the McLean Contracting Company, Baltimore, for the construction of a ferry slip at Market street, Philadelphia, and to the Arthur McMullen Company, New York, for a similar structure at Camden, N. J. Upon the completion of these slips the company will place two new ferry boats in service between Philadelphia and Camden. The slips and boats will cost in excess of $500,000.

The Philadelphia & Reading has announced its intention to begin work on its ferry and railway passenger terminal at Camden, N. J., at a comparatively early date in order to complete the structure before the summer tourist season of 1923. The work will involve the expenditure of approximately $3,000,000.

This company is rebuilding its drawbridge, including additional interlocking installations, at Darby Creek, Pa. The company is also rebuilding 11 bridges in the neighborhood of Harrisburg, Pa., an overhead bridge at Mill Creek Junction, Pa., a drawbridge at Atlantic City, N. J., and a bridge at Chester Springs, Pa. The company is rebuilding its coal yard at Twenty-third and Arch streets, Philadelphia, and is eliminating 5 grade crossings between Swatara, Pa., and Hummelstown and one at Douglassville, Pa. A new passenger station at Swatara and a passenger and freight station at Coatesville are under contract. The company is also installing new refrigerating machinery at Reading Terminal Market, Philadelphia.

The Pittsburgh & Shawmut has awarded a contract to the Concrete Steel Bridge Company, Clarksburg, W. Va., for the construction of a reinforced concrete highway bridge over Colwell Cut, Colwell, Pa. The structure will be 220 ft. long with a span of 180 ft., 24 ft. wide, 110 ft. high and 24 ft. wide. The company has also awarded a contract to the Dwight P. Robinson Company, New York, for lining the remainder of its Mauk tunnel with concrete. Of this tunnel 1,200 ft. have already been so lined, with 900 ft. yet remaining. The company has recently placed in service a new storehouse, oilhouse and car repair shed at its Brookville shops.

The Salt Lake & Denver has been granted a two-year extension of time by the Public Utilities Commission of Utah in which to begin the construction of a railroad which will tap and develop the Uinta Basin, Utah. This corrects the item in the March issue, which stated that this company was authorized to construct an extension to its lines from Springville, Utah, to the Uinta Basin.

The St. Louis-San Francisco contemplates the construction of an extension from Vinita, Okla., to the mines of the Central Coal & Coke Company, a distance of about 5 miles. While surveys for this extension have been made, no definite decision has been reached as to the undertaking of the work.

This company, noted in the March issue as contemplating the construction of a second main track between Spring Hill, Kan., and Paola, a distance of approximately 13 miles, and between Windsor Springs, Mo., and Valley Park, a distance of about 5 miles, has awarded a contract for the former to the Walsh Construction Company, Davenport, Ia., and for the latter work to Grant Smith & Company, St. Paul, Minn.—this to further include grade reduction work at Garnsey, Mo., and Crocker and the construction of 3½ miles of second track at Swedenborg, Mo. The same company will reconstruct with company forces part of its freight house at Henryetta, Okla., recently destroyed by fire.

The St. Louis-Southwestern has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of two 100-ton, electrically operated, reinforced concrete locomotive coaling plants—one at Camden, Ark., and the other at Plano, Tex.

The Staten Island Rapid Transit Company has ordered from the American Car & Foundry Company, Wilmington, Del., a wooden, side-wheel ferry boat, 143 ft. long with a beam of 34 rt. and a draft of 13 ft. and with a displacement of 618 gross tons. This boat, which will be placed in service between Tottenville, Staten Island, and Perth Amboy, N. J., will be completed in five or six months. The company has recently made some improvements in its passenger terminal at Perth Amboy, including the provision of separate runways for passengers and vehicles and the enlargement of the waiting room.

The Southern will construct a second main track between Morristown, Tenn., and New Line, a distance of about 2 miles.

The Tennessee Central contemplates the construction of three small steel bridges, the entire cost of which is estimated at $46,000; two coaling stations with cinder pits; and two small station buildings. An application for a loan to cover the above, and a number of additional improvements has been made to the Interstate Commerce Commission.

The Texas & Pacific is constructing a three-story building at Marshall, Tex., to be used by its apprentices for their instruction and study of car and locomotive work. This company contemplates the enlarging of the terminal facilities of its Trans-Mississippi Terminal at New Orleans, La. No definite decision has been made as to when this work will be undertaken.

The Toledo, St. Louis & Western has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 300-ton coaling station at East St. Louis, Ill.

The Wabash has been petitioned by Decatur, Ill., through the Illinois Commerce Commission, to separate the grades and construct a subway under its tracks at an intersecting point with the public highways just east of the city, and has been directed by the Missouri Public Service Commission to construct a new freight station at Kirksville, Mo., and also to remodel its present passenger station, and to lay several tracks, all of the latter to cost about $44,000.

The Washington, Brandywine & Point Lookout has applied to the Interstate Commerce Commission for authority to increase its capital stock from $100,000 to $500,000 for the purpose of constructing an extension from Mechanicsville to Point Lookout, Md., with branches to Drum Harbor and St. Mary's City.

The Yazoo & Mississippi Valley is accepting bids for the construction of a passenger station at Webb, Miss.

Equipment and Supplies

The Atchison, Topeka & Santa Fe has ordered 10,000 tons of rails from the Colorado Fuel & Iron Company.

The Chesapeake & Ohio is asking for 150 tons of steel for a bridge.

The Chesapeake & Ohio reported in the March issue as inquiring for 21,000 tons of rail, including 3,000 tons for the Hocking Valley, has placed orders as follows: Inland Steel Company, 9,000 tons; Illinois Steel Company, 7,000 tons; Bethlehem Steel Company, 1,000 tons, and 3,000 tons with another company for the Hocking Valley.

The Great Northern is inquiring for 380 tons of steel girder spans for steel bridges. This company is also inquiring for 1,000 tons of reinforcing bars, as well as for 10,400 tons of structural steel for a 350 pocket ore dock; and 1,450 tons of

structural steel for ore spouts, including bails and pins, at Superior, Wis.; and also for 750 tons of structural steel for reinforcement, including stringers and shoes for four truss spans.

The Lehigh & New England is inquiring for 400 tons of fabricated steel for seven bridges on its lines.

The Delaware, Lackawana & Western is asking for prices on 500 tons of fabricated steel for various bridges on its line.

The Missouri Pacific is inquiring for 14,000 angle bars for 90 lb. rails and 39,000 angle bars for 85 lb. rails.

The Missouri Pacific has ordered 20,000 tons of 85 and 90 lb. steel rails as follows: 10,000 tons from the Colorado Fuel & Iron Company; 5,000 tons from the Illinois Steel Company; and 5,000 tons from the Inland Steel Company.

The Northern Pacific has ordered 5,000 tons of rails from the Colorado Fuel & Iron Company.

The Southern Railway closed bids March 20, on 26,600 tons of 85 lb. A. S. C. E. section rail for delivery in approximately equal monthly installments from June to December 1, 1922.

The Union Pacific has ordered 1,500 tons of tie plates from the Colorado Fuel & Iron Company; 350 tons of track spikes from the Inland Steel Company and 200 tons of track bolts from the Kansas City Bolt & Nut Company.

The Union Pacific has ordered 180 tons of structural material for a freight shed at Los Angeles, Calif., from the Llewellyn Iron Works, Los Angeles.

Trade Publications

Roofing Tile.—The Federal Cement Tile Company, Chicago, has published a leaflet containing a brief description, together with illustrations, of the Federal glass tile which it manufactures for roofing installations. The leaflet includes a view of a factory interior in which this tile has been installed and also gives a list of several concerns which are now using the material.

Coaling Stations.—A 25-page booklet has been published by the Howlett Construction Company, Moline, Ill., illustrating and describing its line of coaling station equipment and illustrating several types of coaling stations erected by the company for various railroads. The illustrations are in half-tone and in line drawings and pertain especially to the Howlett hoisting machinery, hoisting buckets, automatic feeder, car puller and coaling gates and chutes.

Acetylene Welding.—The Air Reduction Sales Company, New York, has issued a new catalog leaflet describing its Airco "D" cutting torch. This leaflet describes the various features of design and construction of the apparatus and includes tables showing the thicknesses of metals that can be cut, also tables as to the pressures of oxygen and acetylene necessary and the gas consumption in cubic feet per hour when using tips adapted to the cutting of various metals. The leaflet also includes sectional views of the torch.

Trade Standards in the Pump Industry.—The Hydraulic Society, New York, has recently published a 20-page booklet on trade standards in the pump industry. The text explains what is meant by trade pumps, plain fitted or brass fitted pumps, what is considered standard equipment and what are considered as extras. Typical sizes of trade pumps are shown as well as definitions of terms used in the industry. The subject matter is intended as a guide and represents what the society and its members think is good practice.

Gas Engines.—Bulletin No. 388 has recently been prepared by the Buda Company, Chicago, illustrating and describing a four-cylinder unit power plant of the stationary type which it has recently developed for use in generating electricity around railroad stations, machine shops, in lighting, battery charging, arc welding, etc., and for driving more or less heavy duty pumps, hoists, concrete mixers and similar machinery. The bulletin describes in detail the equipment entering into the power units and includes half-tone illustrations to show the construction and assembly of the machine.

Supply Trade News

Personal

The United States Cast Iron Pipe & Foundry Company, Burlington, N. J., has opened a new office in the Interstate building, Kansas City, Mo., in charge of **D. W. Pratt,** sales agent.

Ross E. Willis, formerly sales engineer of the Lakewood Engineering Company, Cleveland, Ohio, in the southern Michigan territory, has become associated with Wm. F. V. Newmann & Sons, Detroit, Mich., representing the **Baker R. & L. Company** in the Detroit territory.

Charles D. Watson has been elected vice-president of the Watson Engineering Company, Cleveland, Ohio, to succeed H. R. Hadlow, who has retired and **R. L. Harding** has been elected secretary to succeed W. P. Brown, who has also retired. **Wilbur J. Watson** will continue as president and **S. F. Agnew** will resume the position of treasurer, succeeding the late A. R. Warner.

William McClellan, president of the American Institute of Electrical Engineers, has announced the incorporation of the firm of **McClellan & Junkersfeld,** with temporary offices at 141 Broadway, New York. The work of the new organization will be on power plants, transmission systems, water power developments, electrification of railroads and general industrial and utility engineering and construction.

John Lambert, formerly president of the **American Steel & Wire Company,** died at Pasadena, Calif., of pneumonia, on March 6. Mr. Lambert was born at Lambertville, N. J., on January 12, 1847. After serving with the New Jersey cavalry in the Civil War, he came to Joliet, Ill., in 1867. In 1879, he began the manufacture of steel wire and after a series of mergers became president of the American Steel & Wire Company.

Morris A. Zook, formerly resident engineer, Bureau of Valuation, Interstate Commerce Commission, has recently opened offices as a consulting engineer at Plainfield, N. J., where he will specialize in examinations, estimates and reports and all matters in connection with the valuation of common carriers. Mr. Zook was educated at the Polytechnic College of Pennsylvania. Prior to his connection with the Interstate Commerce Commission, Mr. Zook served as resident engineer and division engineer on the Norfolk & Western; assistant engineer and engineer on the Pennsylvania, Lines West; the Chicago, Indianapolis & Louisville as engineer maintenance of way and superintendent; and various other railway and other industries in the capacities of special and consulting engineer.

The Dresser-Minton Company, construction engineers, has been organized by **F. J. Dresser** and **J. H. Minton,** with headquarters in the Arcade building, Cleveland, Ohio. The company has been formed to engage in general building and contracting with special reference to railroad structures. Mr. Dresser has for the last 18 years been concerned with railroad work and was for a number of years with the Chicago & North Western in charge of terminal and bridge work. He was later manager for the contractor in general charge of the construction of engine and car shops for the Pennsylvania and the New York Central. Recently he served as district manager of the Cleveland district of the Austin Company. Mr. Minton was formerly senior assistant engineer in the office of the chief engineer of construction of the Pennsylvania Lines West, at Pittsburgh, Pennsylvania, and has been engaged in railroad construction work for the past 18 years.

The damage from the teredo ravages in San Francisco Bay has resulted in the formal request by President Harding on March 9 for Congress to include in the Navy bill for next year a supplemental appropriation of $2,450,000 for use in studying and overcoming the destructive effect of marine borers.

MAN'S FIRST SHOVEL—*the shoulder-blade of a deer, shaped into a primitive shovel and rudely carved.*

The Deer was the father of the shovel

THE Mound Builders had passed into the limbo of forgotten things long before the Vikings touched our American shores. But the great monuments of earth which they built are still standing.

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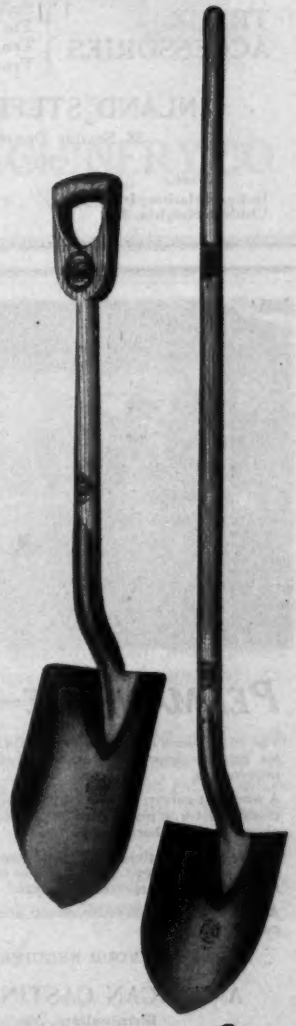

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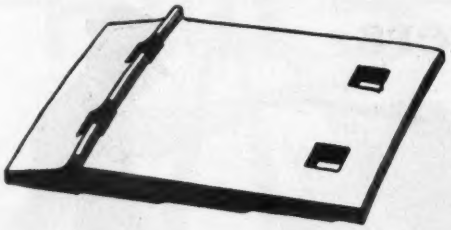

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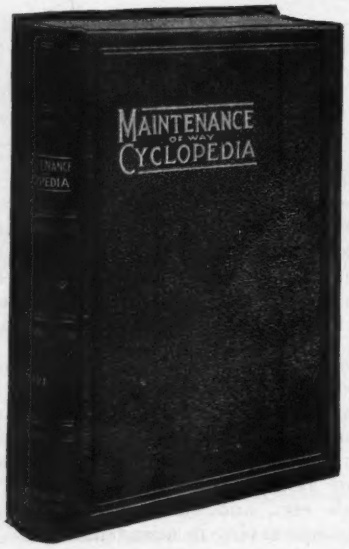

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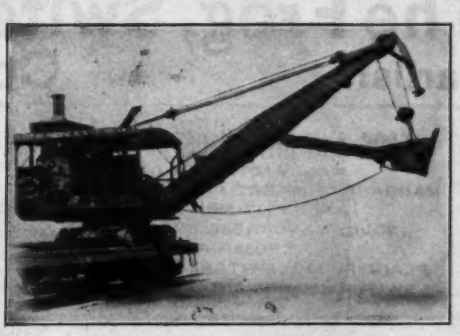

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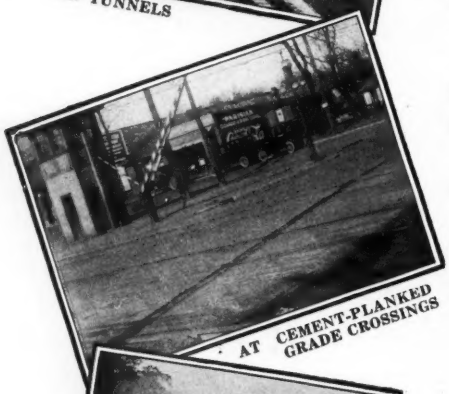
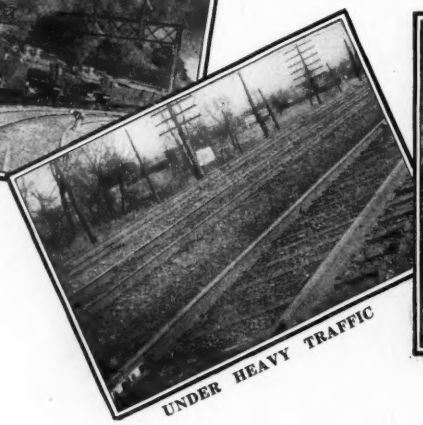


AT CEMENT-PLANKED GRADE CROSSINGS

ON CURVES



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